WIRE AND WIRE PRODUCTS

DECEMBER 1954

MERRY CHRISTMAS
MORGAN
CONNOR

Morgan
Construction
Company
WORCESTER
MASSACHUSETTS

Give your plant
a year 'round Gift
that will mean Better Production and Greater Profits

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

ABOUT FULL HEADS AND SMOOTH THREADS

It is estimated that approximately two percent of the metal in the fabricated product of today is in the fasteners. Manufacturers of products that are assembled of a great many parts know the value of a good fastener.

Bolts, for example, must be exacting in uniformity, especially for mass production assembly. The heads must be full formed and perfectly shaped for reasons of appearance as well as high speed assembly. Threads must be uniform and burr-free, so that parts go together effortlessly.

Manufacturers of bolts spheroidize their wire and rod, alter the structure of the metal itself to improve its flow, in order that they may cold forge perfectly formed bolts at great speeds.

Altering the metal structure uniformly requires controlled annealing, and controlled annealing at reduced costs is a Lee Wilson specialty. That's why, today, more wire and rod is annealed in Lee Wilson furnaces than in any other make.

**Bolt samples on this page through the courtesy of The Lamson-Sessions Co., Cleveland, Ohio, one of the many nationally known screw products manufacturers relying on Lee Wilson annealing furnaces.*

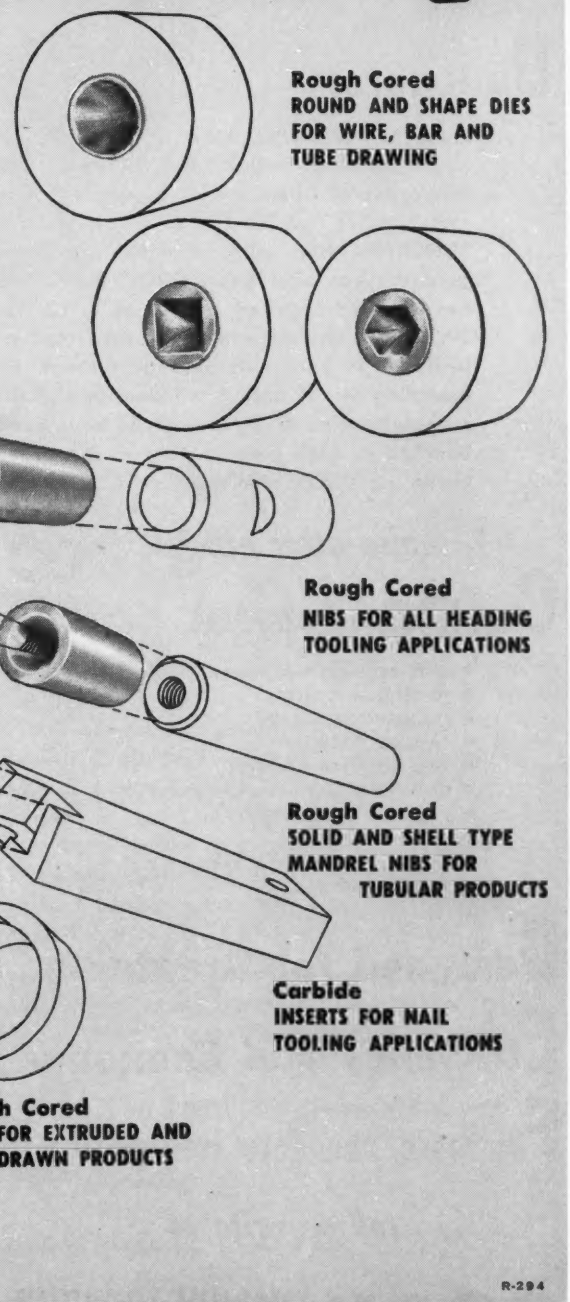
LEE WILSON ENGINEERING CO., INC.
Cleveland 16, Ohio

Specify Firthaloy

FIRTHALOY Sintered Carbide is the standard of quality for drawing and forming operations. It assures maximum production, uniform size, excellent finish and economical operation. To do work better, faster, and cheaper . . . specify FIRTHALOY Sintered Carbide when ordering from your local tool and die maker.

Firth Sterling supplies standard wire, tube and bar dies in a rough cored condition in sizes up to R7. Dies R7 and larger are available both rough cored and rough drilled. In addition, FIRTHALOY Sintered Carbide is furnished in a wide variety of shapes and sizes . . . . another reason why leading tool and die makers have adopted Firth Sterling as a preferred source.

When you specify FIRTHALOY, you are assured of close co-operation between your tool and die maker and experienced Firth Sterling Service Engineers . . . "teamwork" that adds up to maximum performance and increased production.



Rough Cored
ROUND AND SHAPE DIES FOR WIRE, BAR AND TUBE DRAWING

Rough Cored
NIBS FOR ALL HEADING TOOLING APPLICATIONS

Rough Cored
SOLID AND SHELL TYPE MANDREL NIBS FOR TUBULAR PRODUCTS

Carbide
INSERTS FOR NAIL TOOLING APPLICATIONS

Rough Cored
NIBS FOR EXTRUDED AND DEEP-DRAWN PRODUCTS

Carbide
FOR SPRING FORMING TOOLS AND WEAR-RESISTANT PARTS

R-294

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON* WESTFIELD, N.J.*

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High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

IMPROVE THE QUALITY OF YOUR PRODUCT BY THE USE OF COOK EQUIPMENT

Bunchers:

From the VERY FINE WIRE BUNCHER, (BH-8) . . . to the BH-24 with a 24" x 14" reel (1000 lbs. capacity) COOK invites comparison with any buncher . . . for the ability to produce BUNCHED WIRE with smoother concentric quality, year after year! COOK BUNCHERS have formed bunched strands of 7, 10, 16, 19, 26, 41 and 65 wires with such concentricity as to permit its passage through an extruding die of only 1 mil clearance. Such constructions as 27/36 and 41/36 have been bunched at high speed with perfect concentricity, on COOK MACHINES.

also other efficient

Cook Equipment

- WIRE DRAWING MACHINERY
- TWISTERS—SPOOLERS
- ENAMELING MACHINES
- CABLING MACHINES
- WIRE STRING-UP MACHINES
- ENAMELING TAKE-UPS AND PAY-OFFS
- WRAPPING MACHINES
- TINNING POTS
- TINNING TAKE-UPS AND PAY-OFFS
- SPECIAL MACHINERY

Designed for Greater Efficiency and Economy

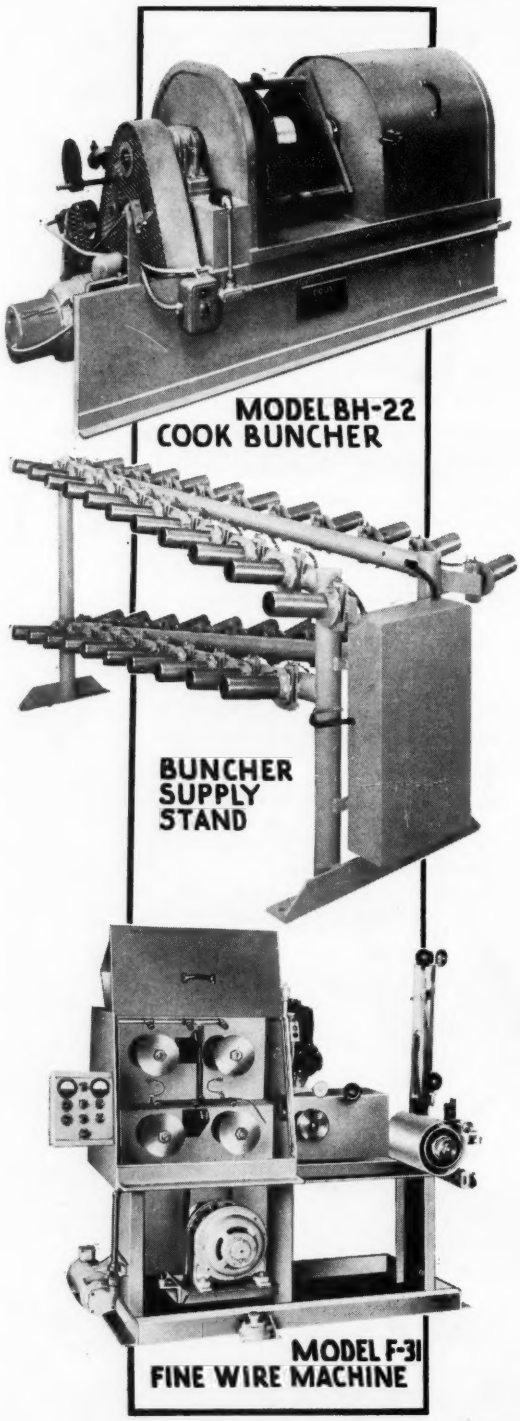
For more complete information

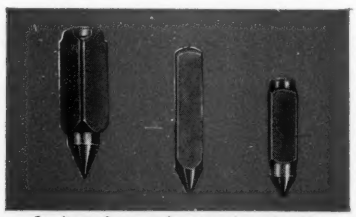
call or write to

COOK MANUFACTURING COMPANY

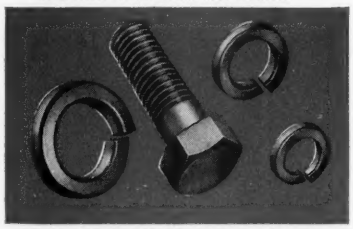
50 EAST 25th STREET • PATERSON, NEW JERSEY

ARmory 4-6380

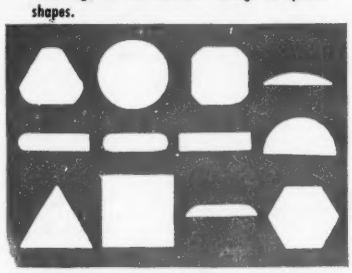




Pre-drawn shapes, such as triangles and squares, are naturals for carburetor needle valves.



Hex-head bolts and flat-wire lock washers take advantage of the material savings of special shapes.



Some of the special shapes now in production. Others can be developed to meet your needs.

ALLOY

Special Wire Shapes

CUT COSTS

Improve Product Performance

Alloy Special Wire Shapes eliminate costly machining time and cut metal waste. No need to start with round wire and then machine half of it away to get the shape you want. Alloy Metal Wire Division is ready to supply you with Stainless and Nickel Alloy wire in just about any special shape you may require. Some of the standard shapes available are shown here. We will be more than willing to work with you in the development of any other shape.

Drawn Alloy Wire Shapes provide other advantages in addition to reduced costs. Product quality and performance are also improved. The drawn wire insures uniformity of cross-section and a smooth, flaw-free surface.

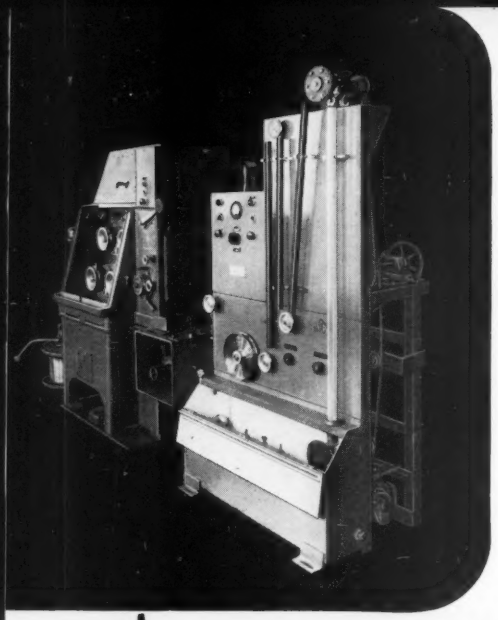
For more details on Alloy Special Wire Shapes or for information on Stainless, Nickel Alloy or Electrical Resistance Wire, Rod and Strip, drop us a line. We are happy to be of service to you.

"Quality Products since 1919"

ALLOY METAL WIRE DIVISION

H. K. PORTER COMPANY, INC.
of Pittsburgh
PROSPECT PARK, PENNSYLVANIA

1



in copper wire mills

AUTOMATION

begins with . . .

• *"LECTRONEALING"*

and

■ *"REELOMATIC"*

spooling

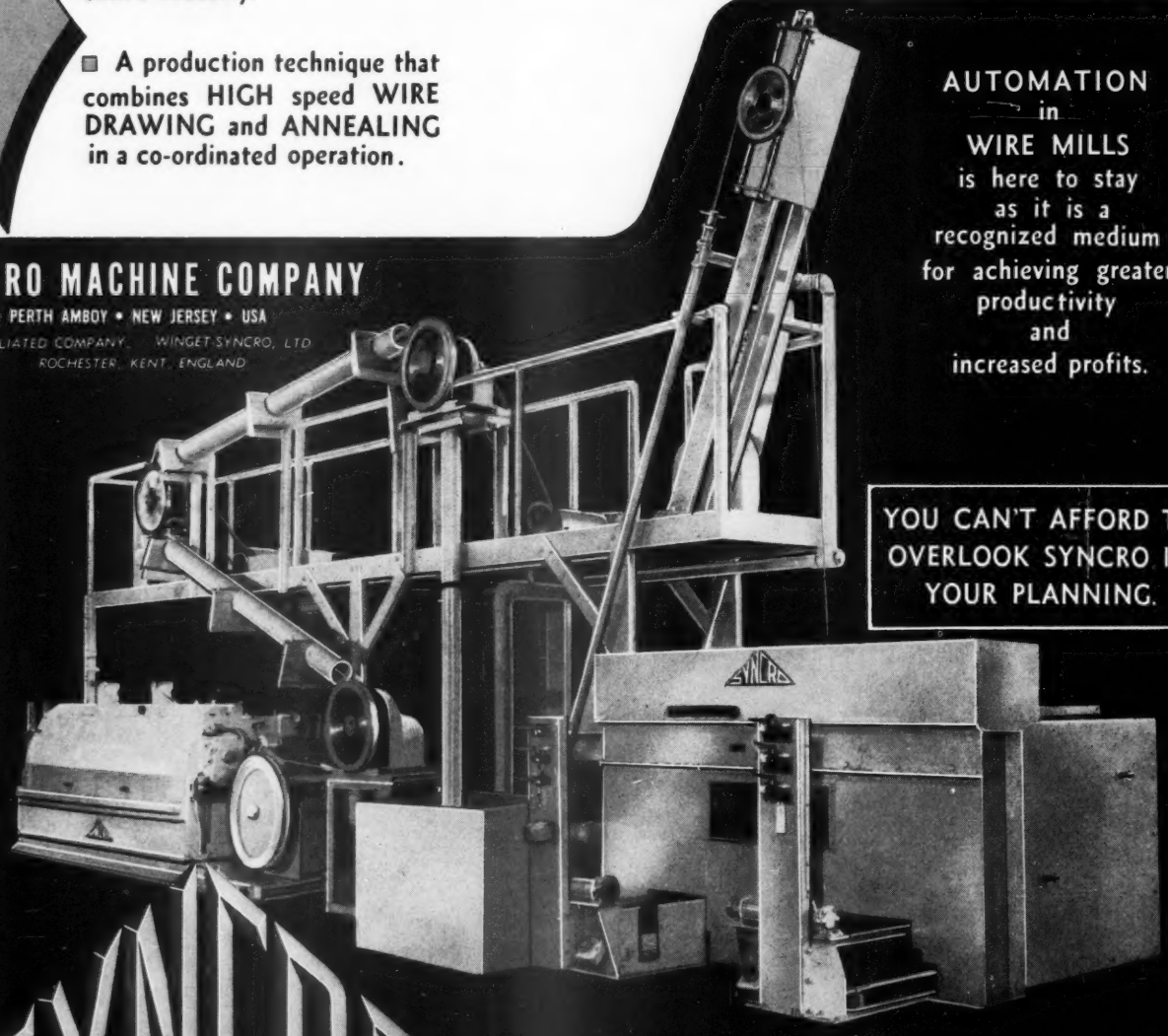
• The AUTOMATED method of continuous ANNEALING that is setting the pace for the entire industry.

■ A production technique that combines HIGH speed WIRE DRAWING and ANNEALING in a co-ordinated operation.

AUTOMATION
in
WIRE MILLS
is here to stay
as it is a
recognized medium
for achieving greater
productivity
and
increased profits.

YOU CAN'T AFFORD TO OVERLOOK SYNCRO IN YOUR PLANNING.

SYNCRO MACHINE COMPANY
PERTH AMBOY • NEW JERSEY • USA
AFFILIATED COMPANY WINGET-SYNCRO, LTD.
ROCHESTER, KENT, ENGLAND



SYNCRO®

Better Machinery for the Wire Industry

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29 DECEMBER, 1954 No. 12

Designated as Official Publication By The Wire Association

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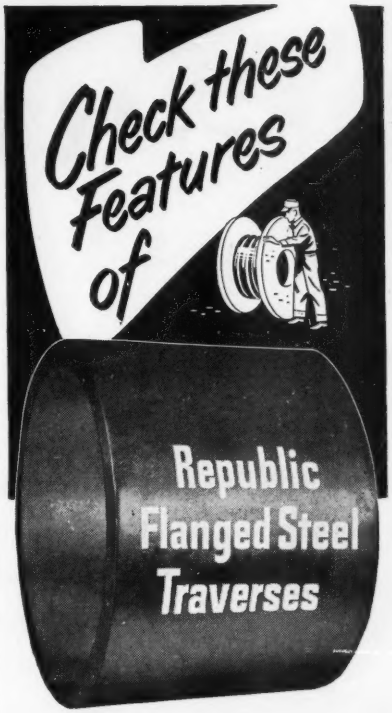

1. Light Weight

2. High Strength

3. Top Durability

4. Easy to Assemble

5. Smooth Galvanized Surface—no rough spots to damage plastic-covered cable

● Made in sizes up to 56-inch diameter and 48-inch traverse—in plain, painted or hot dip galvanized finish—as light as 18-gauge steel. Width of flange and number of bolt and drain holes furnished to your specifications. Available for prompt delivery. Write for prices.

* * *

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REPUBLIC STEEL CORPORATION
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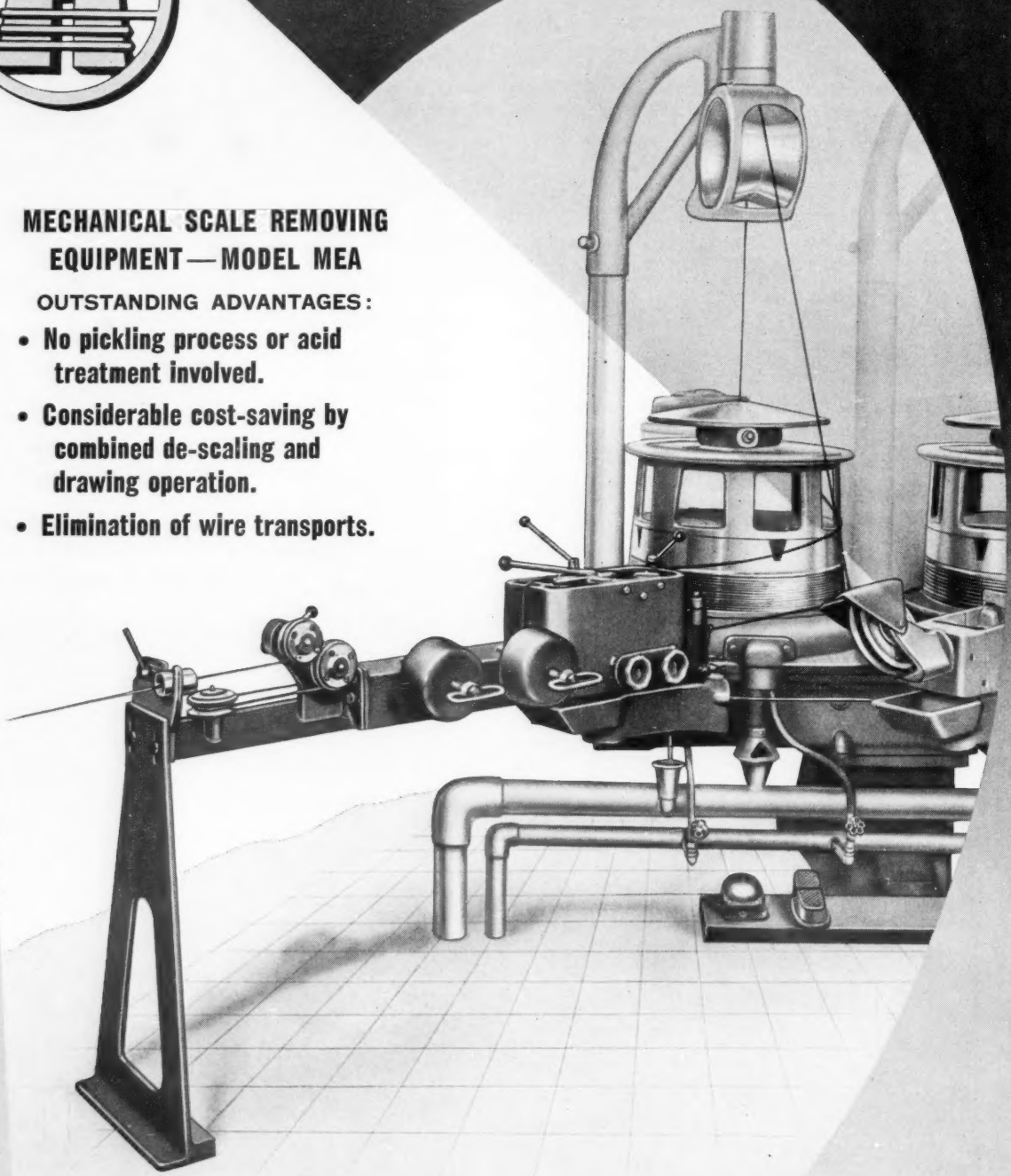
HERBORN

MECHANICAL SCALE REMOVING EQUIPMENT — MODEL MEA

OUTSTANDING ADVANTAGES:

- **No pickling process or acid treatment involved.**
- **Considerable cost-saving by combined de-scaling and drawing operation.**
- **Elimination of wire transports.**



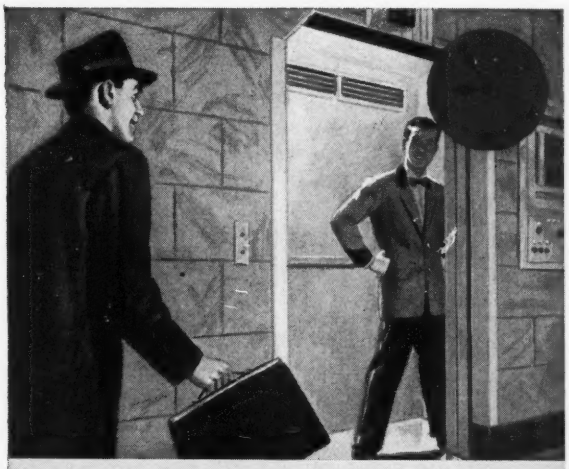
MASCHINENFABRIK HERBORN

BERKENHOFF & DREBES A.-G. • HERBORN (DILLKREIS) GERMANY

Sole Agent in U. S. A.: Kurt Orban Company Inc., 34 Exchange Place, Jersey City 2, N. J.

Sole Agent in Great Britain: P. A. Mead Ltd., 3 Vincent Parade, Finsbury Park, London, N. 4, Telephone: ARChway 2127.

In this advertisement we continue to take you through a typical day in the life of John Q. Citizen...showing you the part CF&I-Wickwire Wire plays in his everyday activities.



OFFICE BUILDING—8:55A.M. John never stops to think about it but he rides up to work on dependable elevator cable. Without this indispensable wire product—much of it made of CF&I-Wickwire Wire—modern multi-story buildings would be unable to function.

OFFICE—9:00 A.M. Here we are, inside John's office. Where is the wire? All around us. Paper clips inside the desks. Springs inside the telephones and the typewriters—even under John's swivel chair. Staples, coat hangers, ring binders—these and countless other office necessities are made from wire—very often of CF&I-Wickwire Wire.

FACTORY—3:00 P.M. Let's accompany John on a trip to his firm's nearby factory. The premises are inclosed by a wire fence. Inside, we find wire mesh cloth used as machinery guards. Metal processing belts made of woven wire. Springs of every variety to keep the machines going. All of these products use CF&I-Wickwire Wire.

Watch for the balance of John's day **in our next advertisement which takes John back to his home and the relaxation of his living room.**

For the Wire You Require — Check CF&I-Wickwire

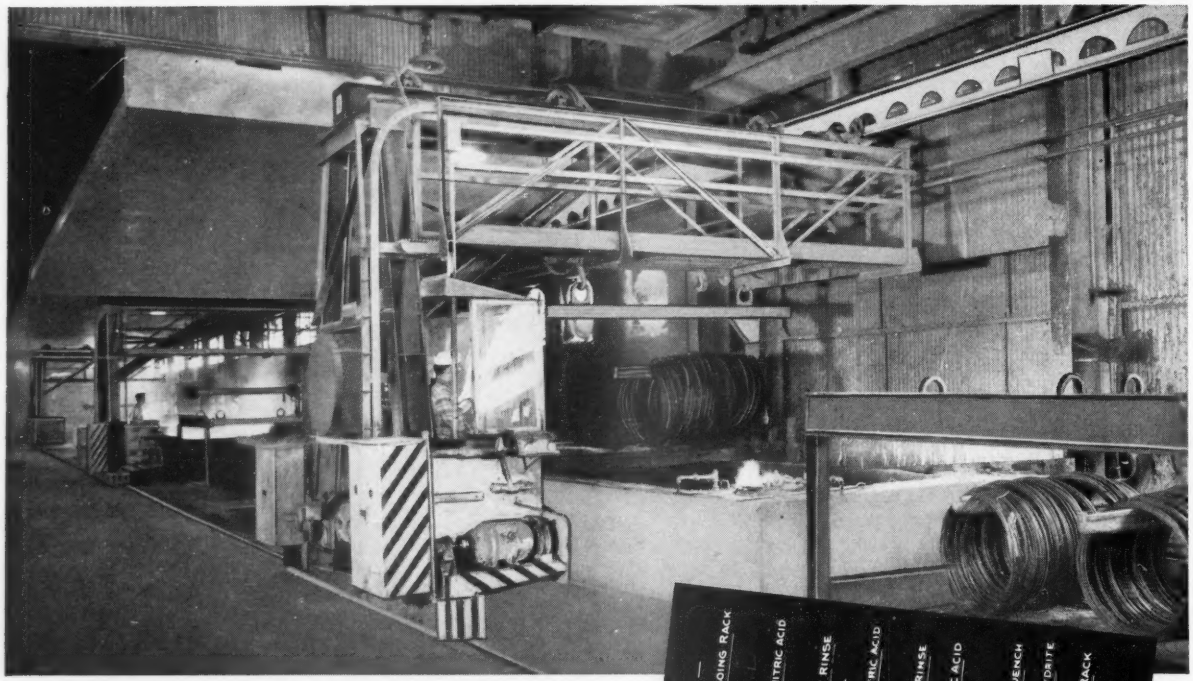
CF&I-WICKWIRE WIRE

THE COLORADO FUEL AND IRON CORPORATION

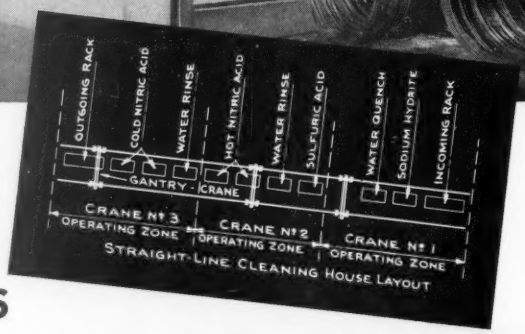
WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia
THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston
Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • Seattle • Spokane • Wichita

2692

WIRE PRODUCTION SPEEDED
WITH STRAIGHT-LINE CLEANING PROCESS



Three gantry cranes operate at high speed around the clock in this cleaning house. Note how clean and orderly this room is. These are contributing factors to the high production rate secured.



THREE GANTRY CRANES ON SAME LINE PROVE HIGHLY ADVANTAGEOUS

Thousands of tons of wire are cleaned monthly by three especially designed Cleveland Tramrail gantry cranes working 24 hours a day, seven days a week, in the cleaning house of an important stainless steel producer.

Each crane is assigned to a section of the straight-line layout. The first crane picks up loaded hooks of wire from a rack and dunks them in a sodium hydrite tank and a water quench. Then the second crane takes over, advancing the wire through a sulfuric acid tank, water rinse and hot nitric acid bath. The third crane carries them through a water rinse and cold nitric acid tank and places them on the outgoing rack.

The efficiency which a straight-line layout with gantry cranes introduces in a cleaning house is usually an eye-catching figure. Man-hours required for cleaning a given amount are generally reduced from one-third to one-half over that for old-fashioned cleaning methods. In addition, a 50% saving in floor space is made. Another important feature is the cleanliness that it makes possible. To operate in a clean, orderly room not only aids production, but is more healthful for employees and boosts their morale.

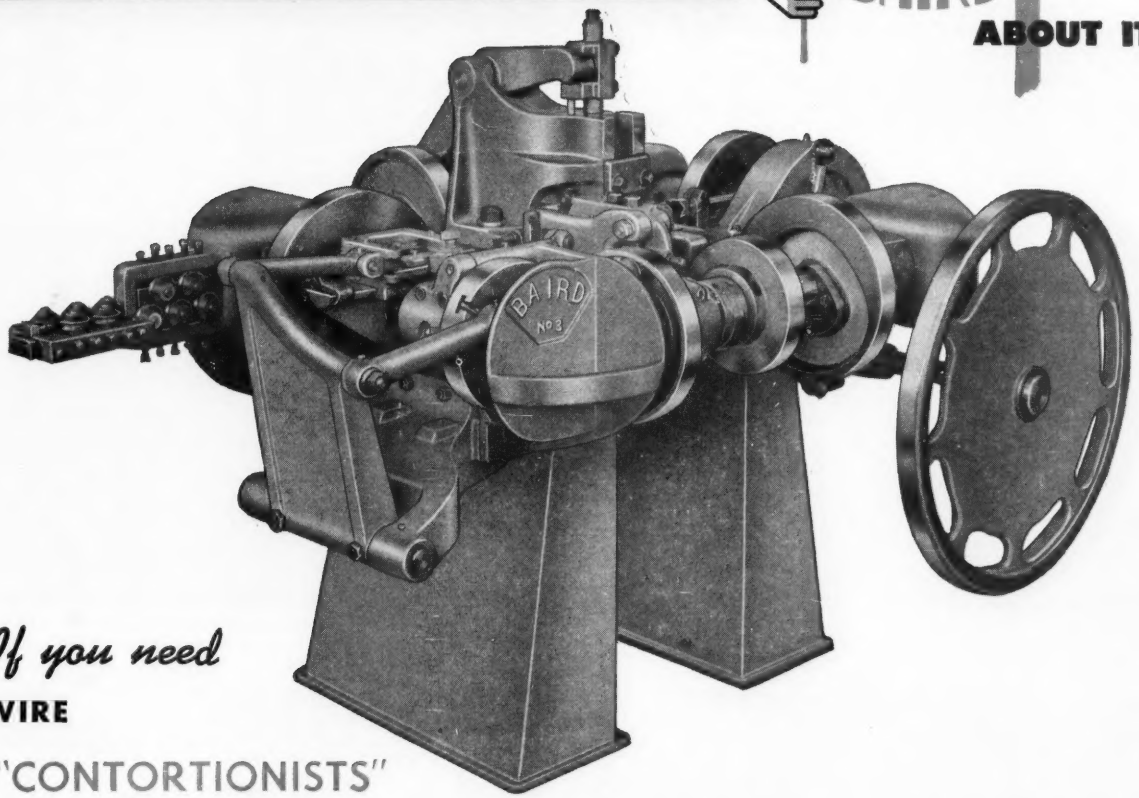
GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9219 EAST 288 STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



If you need

WIRE

"CONTORTIONISTS"

The BAIRD FOUR-SLIDE is your FORMING MACHINE

There is probably no machine in the world that can make a greater variety of parts . . . or produce them any faster . . . than the Baird Four-Slide. It seems that there must be a limit to the fashioning of small wire and metal ribbon products *by hand* . . . and then tooling a Baird Machine to make them *automatically.* Yet, new shapes are continuously submitted to us . . . and we still find the solutions.

Taking coiled wire from a reel, the machine straightens, feeds, and cuts off the required length . . . then forms and ejects the part. Different sizes of standard machines give you a selection of wire lengths to 32½" . . . dia. to ½" or flat ribbon metal products to 1½" wide. Special attachments such as *secondary cut-offs, lettering, form raising, pin pulling, nail pointing, vertical forming and stripping, ring setting, etc.,* extend the versatility of operations.

Thus you may purchase your machines for specific repetitive production, then, at any time, add special attachments as your production requirements indicate. At all times you may count on Baird engineers for development of tooling from your parts or specifications.

This is your profit-making machine. Send for the Baird Four-Slide Bulletin.

2BA54

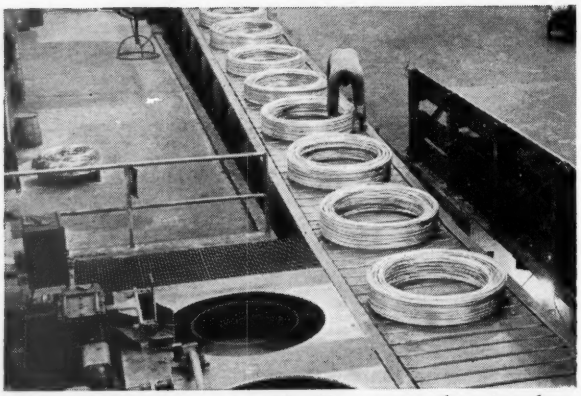
THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

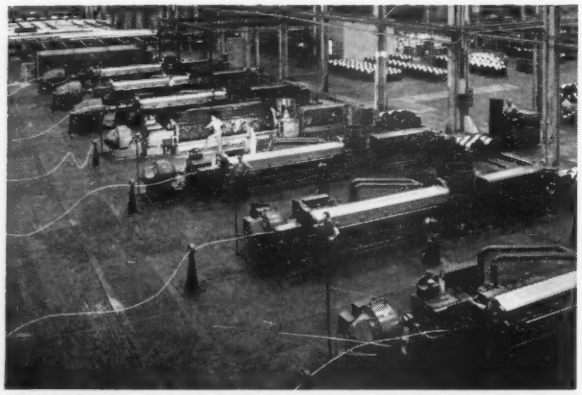
AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

QUALITY

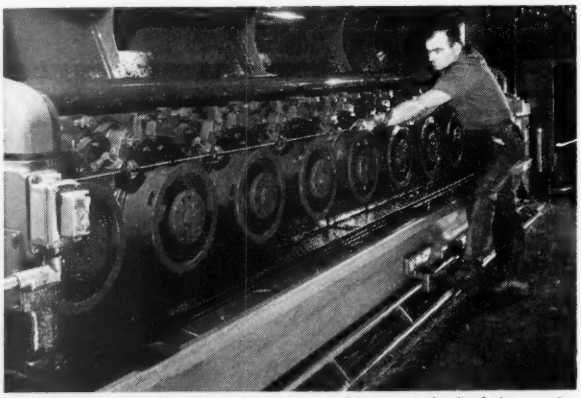
At centrally-located Newark, Ohio, Kaiser Aluminum operates one of the best-equipped high production mills in the nation, producing highest quality wire to meet your specifications. Illustrated here are a few of the reasons for this high quality.



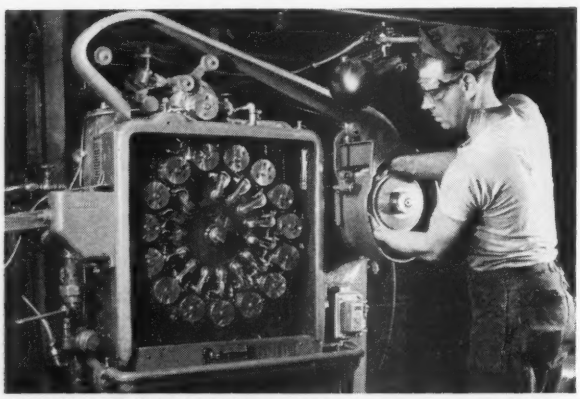
COILED ROD rolled from the 10" mill—newest and most modern mill of its kind in the country.



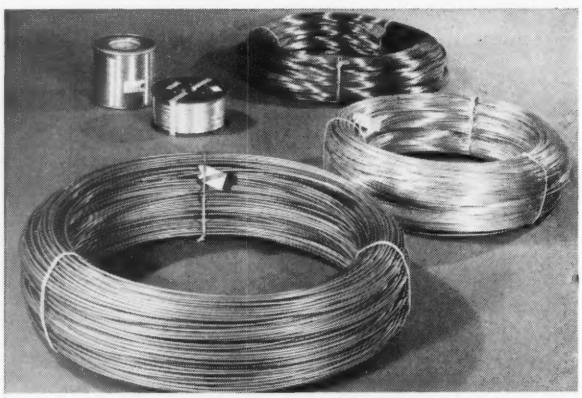
A SECTION OF our wire drawing department where modern, precision machines draw down the ⅜" rod into wire.



CLOSE-UP OF Vaughn wire drawing machine—typical of the modern equipment throughout the mill.



FINE WIRE DRAWING MACHINES showing the arrangement of discs which successively reduce the size of the wire.



RESULT OF modern machinery and expert personnel—quality wire that meets your exact specifications.

OUR WIRE FOR FABRICATORS OF WIRE PRODUCTS includes, round drawn wire, manufacturers' wire, hexagonal wire, rivet wire, welding wire, spooled fine wire, screen wire, and EC wire—in alloys, diameters and tempers to meet your exact specifications.

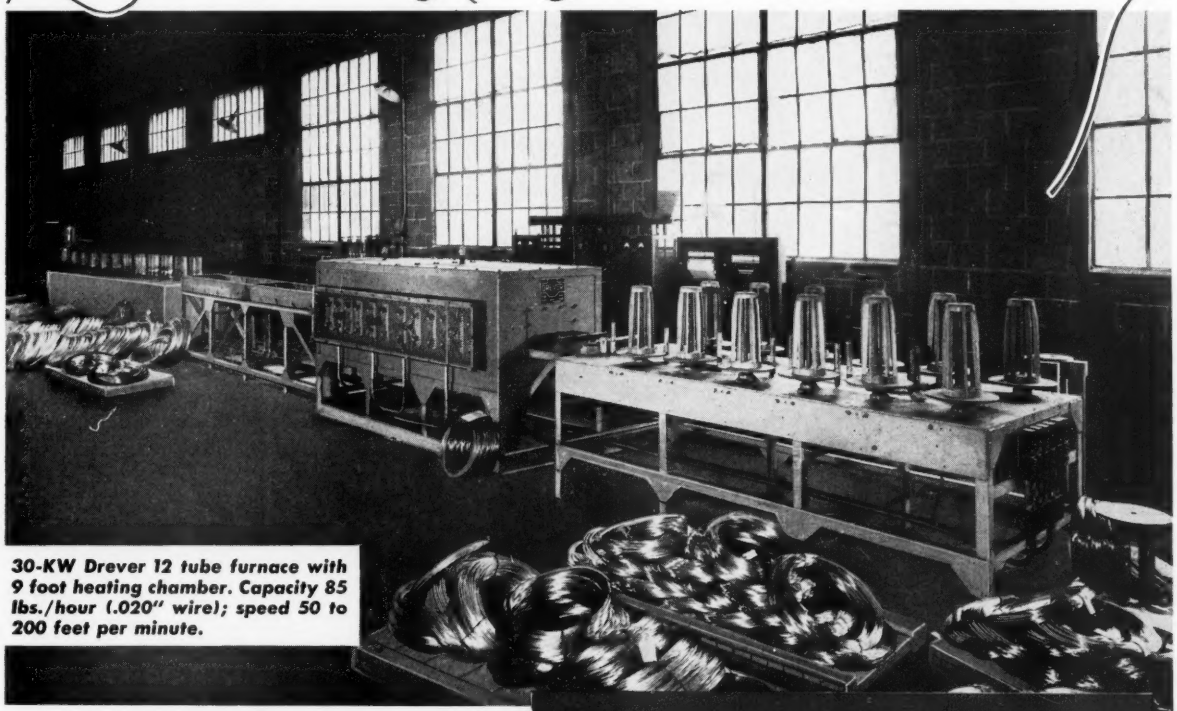
In addition, we produce redraw rod and redraw wire for further drawing by wire mills into finished products.

For immediate attention to your needs, contact any Kaiser Aluminum sales office listed in your telephone directory, or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

Strand Annealers



30-KW Drever 12 tube furnace with 9 foot heating chamber. Capacity 85 lbs./hour (.020" wire); speed 50 to 200 feet per minute.

FOR

Bright Annealing

Clean Bright high quality stainless or alloy wire is heat treated economically in Drever Continuous Bright Annealing Furnaces.

Versatility of production is possible by design of pay-off and recoiling mechanisms. Each block is driven individually, thus wire of different diameters may be annealed at varying speeds at the same time.

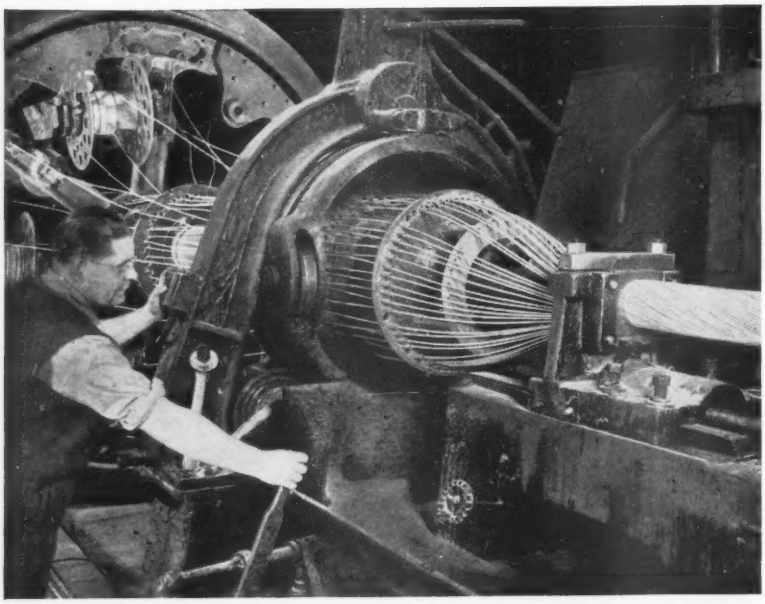
Proper atmosphere equipment is supplied depending on type of wire to be bright annealed.

Write for further details on this or other type of Drever Furnaces.

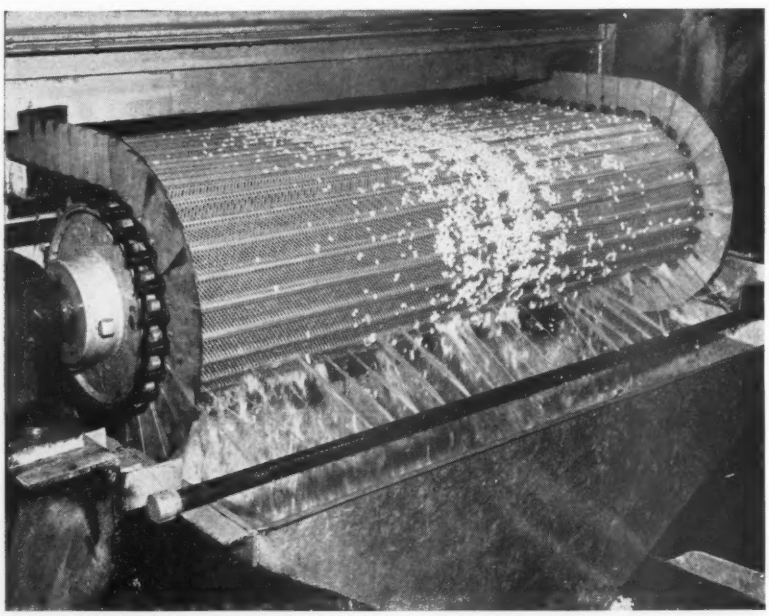
DREVER COMPANY

BETHAYRES, PA.

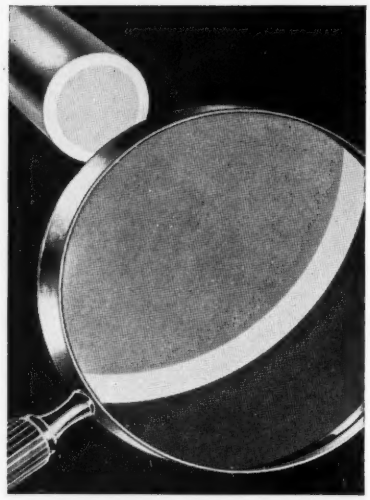
The zinc won't crack or peel when it's BETHANIZED WIRE



This submarine power cable, 4.6 in. in diameter, has an outer armor of 52 bethanized wires. Designed to transmit 27,000 hp, the 7½-mile cable is laid across the bottom of Puget Sound. It was built by The Okonite Co., Passaic, N. J., for the Bonneville Power Administration.



Bethanized wire takes a constant dousing from hot-steam and cold-water sprays as it keeps cut corn on the move in this food-freezing plant. This conveyor belt, made by The Cambridge Wire Cloth Co., Cambridge, Md., has given excellent service due to its sound construction and the long-lasting bethanized coating.



The uniform coating of pure, ductile zinc is locked on the steel. That's why bethanized wire is so resistant to corrosion, and can take such severe forming without damage to its protective armor.

Pure zinc, perfectly bonded to steel —that's bethanized wire. Bend it, twist it, wrap it—even draw it—and the highly-pure, ductile zinc armor stays put. You can depend on bethanized wire, even though the job calls for severe forming, weaving or wrapping.

New users are surprised to discover how uniform the bethanized coating is, and how tightly it's bonded to the steel. That's the result of the bethanizing process, which electrolytically deposits the 99.99-pct-pure zinc, atom by atom, on the steel wire.

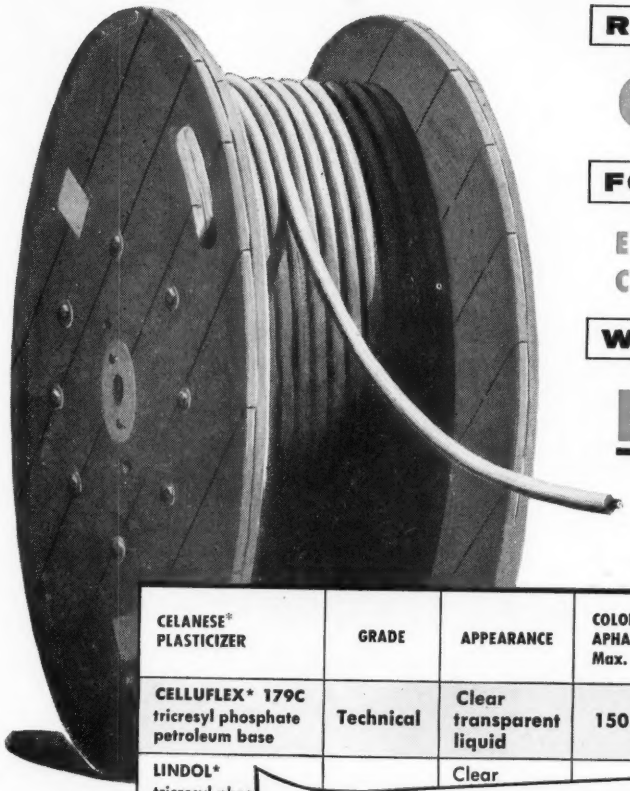
The tight, bright bethanized coating is adding sparkle and eye appeal, as well as improved serviceability, to hundreds of products made from zinc-coated wire. Like to have us arrange for a trial order in your plant? Just phone or write the nearest Bethlehem sales office for complete details.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

CELANESE* PLASTICIZER



RECOMMENDED

CELLUFLEX* 179C

FOR

ELECTRICAL WIRE AND CABLE COATINGS

WHY

FLAME RESISTANCE

DESCRIPTIVE DATA

CELANESE* PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @ 20/20° C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (in Minutes)	REFRACTIVE INDEX @ $n\frac{20°\,C.}{D}$
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (3)	99	30	1.553 (5)
LINDOL* tricresyl phos… coal tar ba…		Clear						…56
CELLUFLEX dibutyl ph…								…389
CELLUFLEX a mixed est…								…0 (5)
CELLUFLEX* triphenyl ph…								1.550 (6)
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.985 ± .002	0.01 (2)	98	—	1.4859

now available in limited commercial quantities

CELLUFLEX 179 EG

Ask your Celanese representative about this new electrical grade Tricresyl Phosphate, specially developed for insulation applications.

(1) @ 60/60°C. (2) % as phthalic, max. (3) % as phosphoric, max. (4) Molten (5) @ $n\frac{25°\,C.}{D}$ (6) @ $n\frac{60°\,C.}{D}$

Celluflex 179C — tricresyl phosphate commercially developed by Celanese—is recognized as the No. 1 flame-resistant plasticizer. Its low volatility, excellent solvent power and high degree of permanence produce tough flexible vinyl coatings for transformer wires and electrical cable.

Celanese is an expanding source of plasticizers for many jobs. Bulk stocks at convenient distribution points are ready to meet tight schedules. Combination shipments—Celanese Plasticizers and Solvents or Intermediates—yield an extra dividend in price differential and freight savings. Be on our mailing list for new plasticizer developments. Please drop a card to Dept. 590-L. Celanese Corporation of America, Chemical Division, 180 Madison Avenue, New York 16.

Celanese* CHEMICALS

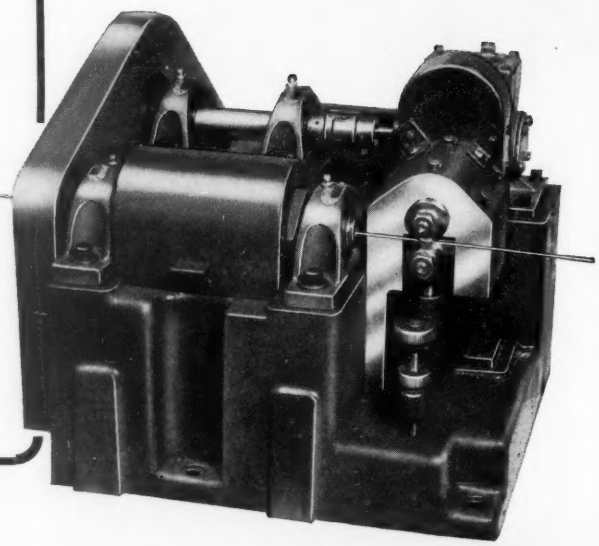
*Reg. U. S. Pat. Off.

Straightens

.020 to .040

Wire

(or .025 to .062)



NEW BENCH MODEL WIRE STRAIGHTENER WITH *AUTOMATIC* FEED

This self-feeding, rotary straightener is exceptionally sturdy and compact, measuring only 16" for its longest dimension. Designed as the answer for small shop requirements of straightening fine wire, pilot models have already been endorsed by larger users of wire as a necessary auxiliary. A choice of arbors mounted in ball bearings each with five straightening dies, is available, one for wire in the .020 to .040 range and the other in the .025 to .062 range.

The machine comes fully equipped with ½ horsepower high speed motor and mounting lugs for bench installation. These wire straightening units can be supplied geared to feed 30, 60, or 90 feet per minute, as specified when ordered. One set of cast iron dies is included, along with stub screws, wrench, necessary guards and gear reducer. Other dies are supplied for various types of metal.

Write for complete data, giving us your requirements.

MANUFACTURED BY

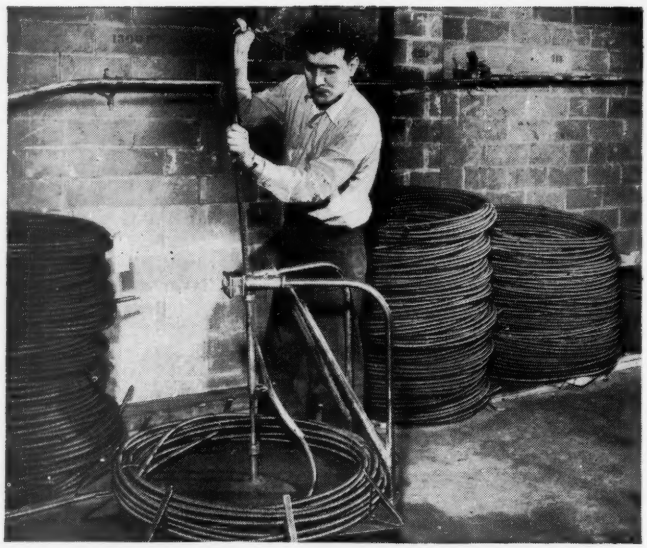
METTLER MACHINE TOOL, INC.

132 Lawrence Street, New Haven, Conn.

SHUSTER *Automatic* — *Since 1866* — WIRE STRAIGHTENING AND CUTTING MACHINES

Quality Protected
...Costs Reduced
AT
SOUTHWIRE COMPANY
CARROLLTON, GEORGIA
They report that Elgin Diamond is easier to work with and results in a lower finishing cost per die. That's because Elgin Diamond is precision graded for particle uniformity and contained in a color-identified, lubricant-type vehicle. There's no waste, no mistakes, no loss of cutting efficiency. Why not protect your product's quality like others do . . . with Elgin Diamond.
ABRASIVES DIVISION
Dept. G
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS
ELGIN
DIAMOND
DYMO-C
Grade
Lot No.
ELGIN DIAMOND

1. THESE LARGE REELS of steel wire are manufactured to the exact specifications of the Roto-Rooter Corporation. Here Roto-Rooter employee Glen Anderson operates an electric hoist to transfer a reel of wire to the coil forming machine, where it is formed into one of the various sizes of flexible cable used in the Roto-Rooter machines.



2. ILLUSTRATED HERE is the coiling machine which is used to place the bulk cable coming from the coiling machine into the Roto-Rooter machine reels.

"That AS&W wire is really wire!"

says R. A. YOUNG,

Secretary of the Roto-Rooter Corporation, Des Moines, Iowa

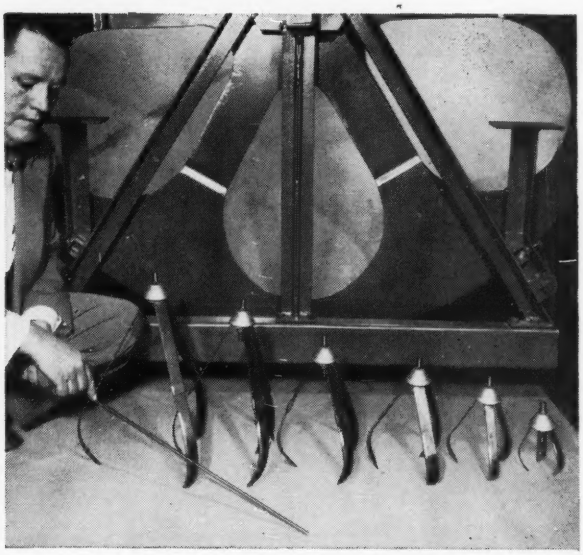
"Our business is making machines*—a special sewer and drain-cleaning machine called the Roto-Rooter. Strict specifications are followed in the manufacture of the Roto-Rooter, especially in the flexible steel cable which is the heart of the machine. That cable must be really tough — strong enough to withstand the acute twisting action of the revolving reel, flexible enough to negotiate the sharpest bends and turns, highly resistant to the corrosive elements found in all sewers. That cable absorbs a terrific beating, and naturally it must be fabricated from an especially high grade steel wire.

"We found the kind of wire we need at American Steel & Wire. Our engineers got together with the AS&W metallurgists, working out the heat treating and hardness specifications. The wire we get from AS&W is made especially for us, and is not used by any other manufacturer. One of the things we like best about AS&W is their constant adherence to our close-tolerance specifications. And we're more than satisfied with the terrific performance of the steel wire in our machines. That AS&W wire is *really* wire!"

The experience of the Roto-Rooter Corporation is not unusual. Thousands of manufacturers all over the country have learned to depend on the consistently high quality of USS American Manufacturers Wire. A better-grade steel wire enables you to do a better fabricating job . . . and often saves you money, too.

American Steel & Wire carries, *in stock,* over 400 different types of American Manufacturers Wire, including Stainless, for you to choose from. For special requirements, our trained staff will work with you to develop a new wire that will meet your specifications exactly. Why not let us help you with *your* steel wire problems? If you make it of wire, make it of the best—USS American Manufacturers Wire.

3. EMPLOYEE J. B. THOMAS is shown attaching the steel cutting blades to flexible steel cable on the Roto-Rooter machine. The revolving reel shown on the right housed 120′ of this ¾″ AS&W steel cable. In the background can be seen the stockpile of finished cables ready for installation in the machine.



4. N. W. LARSEN of the Roto-Rooter Corporation shows the various sizes of Roto-Rooter cutting blades. In operation, the blades are attached to the end of the flexible cable and receive their cutting motion from the revolving reel at the opposite end through the steel cable.

5. AND HERE'S a finished Roto-Rooter in operation with the cutting blades about to be inserted into the sewer line. The razor sharp, high-speed rotating blades cut all roots, grease, scale, and other debris into tiny pieces, leaving the line as clean as the day it was installed. The specially-designed steel cable has to absorb a terrific beating in negotiating the sharp turns and bends found in domestic sewer lines—as high as four or five 90° turns in one operation. It's easy to see why the Roto-Rooter Corporation insists on the highest standards of quality in the steel wire they use in these cables . . . and why they use American Manufacturers Wire exclusively.

*Roto-Rooter is a nationwide sewer service and Roto-Rooter machines are placed only on an exclusive franchise basis.

If you make it of wire...
make it of the best!

U S S AMERICAN MANUFACTURERS WIRE

AMERICAN MANUFACTURERS WIRE

AMERFINE—*High-quality fine wire.*

AMERSPRING—*music steel spring wire.*

AMERLOY—*alloy heading wire.*

AMERTEMP—*heavy-duty oil-tempered wire.*

AMERHEAD—*uniform heading wire.*

AMERSTITCH—*extra-tough metal stitching wire.*

USS

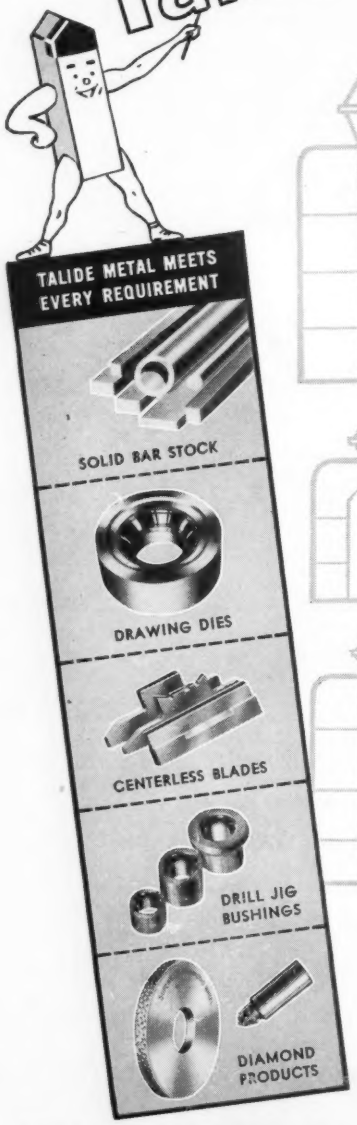
AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO

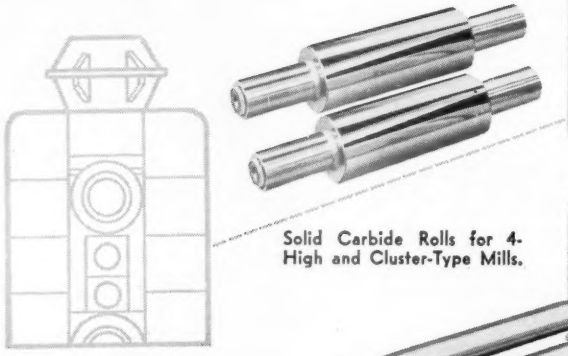
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

Talide ROLLS double production of your mill

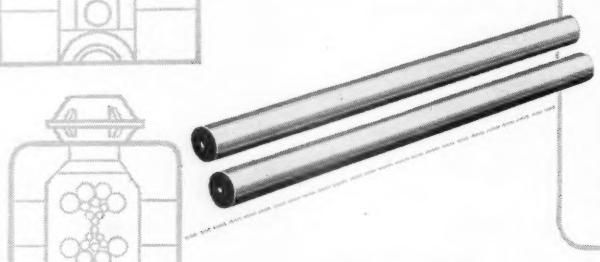




Solid Carbide Rolls for 4-High and Cluster-Type Mills.

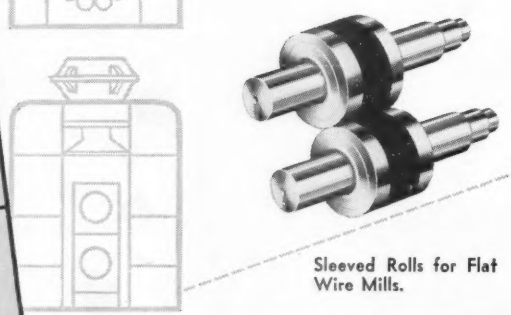
1600 to 20 coils

LARGE PITTSBURGH STRIP STEEL PRODUCER reports rolling 1600 coils of low carbon, high carbon, stainless and alloy steel strip with Talide rolls before same needed regrinding. Best previous service life obtained with steel rolls averaged between 16 and 20 coils.



168 to 7 hours

LEADING OHIO STRIP STEEL PRODUCER averages 750 coils of various types and analysis between grinds, enabling them to operate their cold rolling mill continuously without roll changes for 7 days, 3 turns per day. Previous steel rolls used averaged 6-8 hours, necessitating 3 or 4 roll changes per day with considerable down-time.



Sleeved Rolls for Flat Wire Mills.

50 to 2 coils

LARGE STEEL PRODUCER of straight chrome and nickel-chrome stainless steel strip now operates continuously for 3 turns or more with Talide rolls, whereas with steel rolls it was necessary to change 7 or 8 pair per turn. 50 coils are now rolled per regrind compared to 2 coils with steel rolls.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Send for New 84-Page Catalog 54-G or Ask for Sales Engineer to Call.
Metal Carbides Corp., Youngstown 7, Ohio

if you need stainless wire — call CRUCIBLE for quick delivery

For any diameter from the smallest to half an inch or more . . . in any temper from dead soft to full hard . . . with a bright surface, or with one of many metallic or nonmetallic finishes — yes, for *any* stainless steel wire, call Crucible.

Crucible's modern stainless steel wire mill is the last word in up-to-date production facilities. What's more, this is combined with the very finest metallurgical and quality control setup you can find anywhere. It means, for you, that every coil . . . every length . . . *every inch* of Crucible stainless steel wire can be produced to the most rigid standards of quality — that Crucible stainless wire conforms to precise standards of uniformity that are unsurpassed in the industry.

So, whatever your requirements for stainless wire — cold heading . . . free machining . . . spring . . . rope . . . weaving . . . armature binding . . . slide forming — Crucible's fine new mill is ready to serve you promptly with wire products of the very highest quality. Call your nearest Crucible warehouse for prompt delivery.

CRUCIBLE first name in special purpose steels

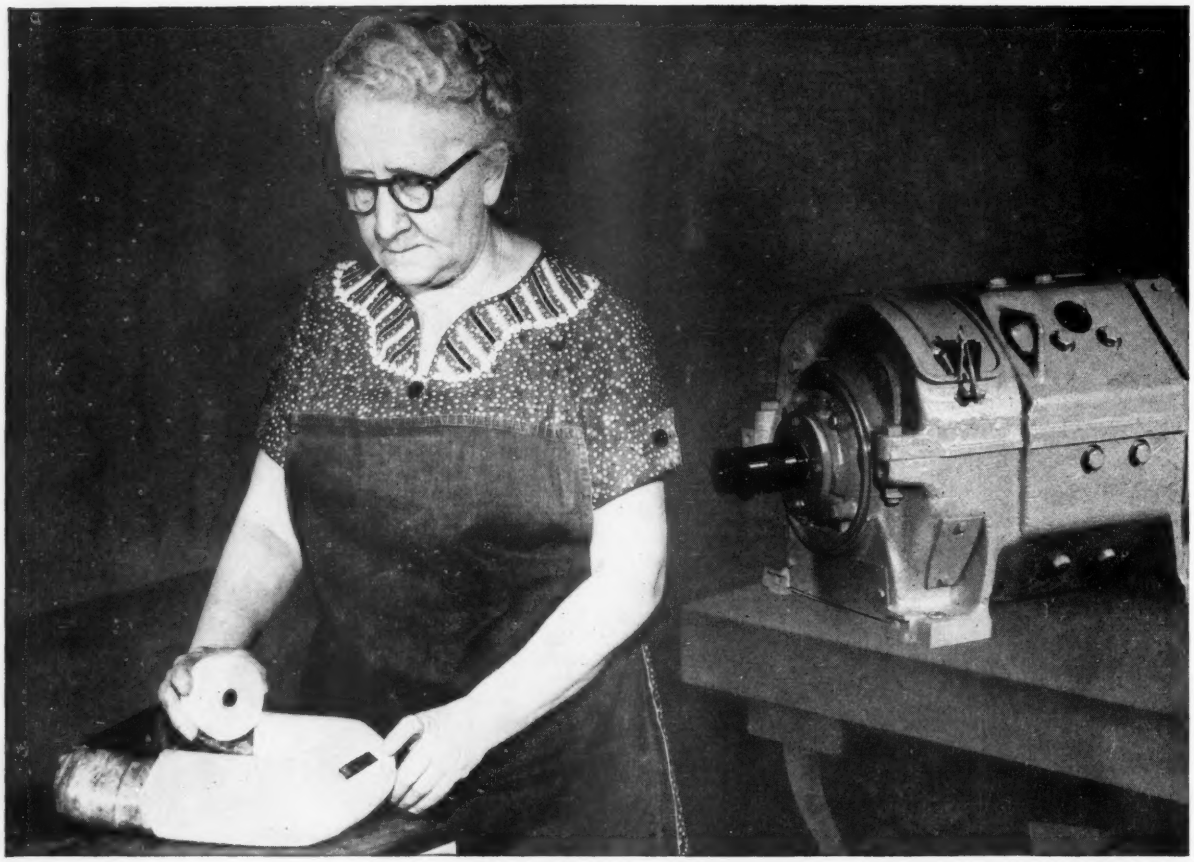
54 years of Fine steelmaking

STAINLESS STEEL WIRE

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



General Electric uses Fiber·Glass tape to withstand high temperatures, heavy overloads

This photo shows Fiber·Glass tape being applied to a field coil, in the manufacture of General Electric Armored Motors, type MD.

These motors, produced by the Erie, Pennsylvania Works of General Electric Direct Current Motor and Generator Department, are used in the toughest applications—as steel mill auxiliaries, ore bridge, crane, hoist, and electric shovel applications. They need the finest insulation available to withstand high temperatures and heavy overloads, hence the use of Fiber·Glass.

Tapes made with L·O·F Fiber·Glass are used where prolonged overloads generate heat too great for organic tapes. They are strong. They resist moisture.

For the wire and cable industry, Libbey·Owens·Ford produces a complete series of continuous filament yarns, including: 75, 150, 225, 450 and 900 series. They are made in a variety of single- and multiple-end packages for use on standard wire-covering and textile machines. Waxed yarns are available, as well as special after-treatments.

Consult us on your electrical needs. Contact your nearest L·O·F office (offices in 26 major cities). Or, write: Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 26-124 Wayne Building, Toledo 3, Ohio.

L·O·F GLASS · Corrulux · FIBER-GLASS

FIBER · GLASS

LIBBEY • OWENS • FORD GLASS COMPANY
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America's Finest Wire Drawing Lubricants

Presenting:

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SERVICE INCOMPARABLE
SALES INTEGRITY
SOAPS IMPERIAL
and
A WISH FOR A MOST PROSPEROUS NEW YEAR

>NEW<

NO. 230
FOR HIGH SPEED DRAWING and NAIL MAKING

NO. 224
HANDKERCHIEF CLEAN and BRIGHT

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NOT NEW BUT NEVER EQUALLED

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

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New Quality...

in wire and cable insulation

in sleeving and tubing

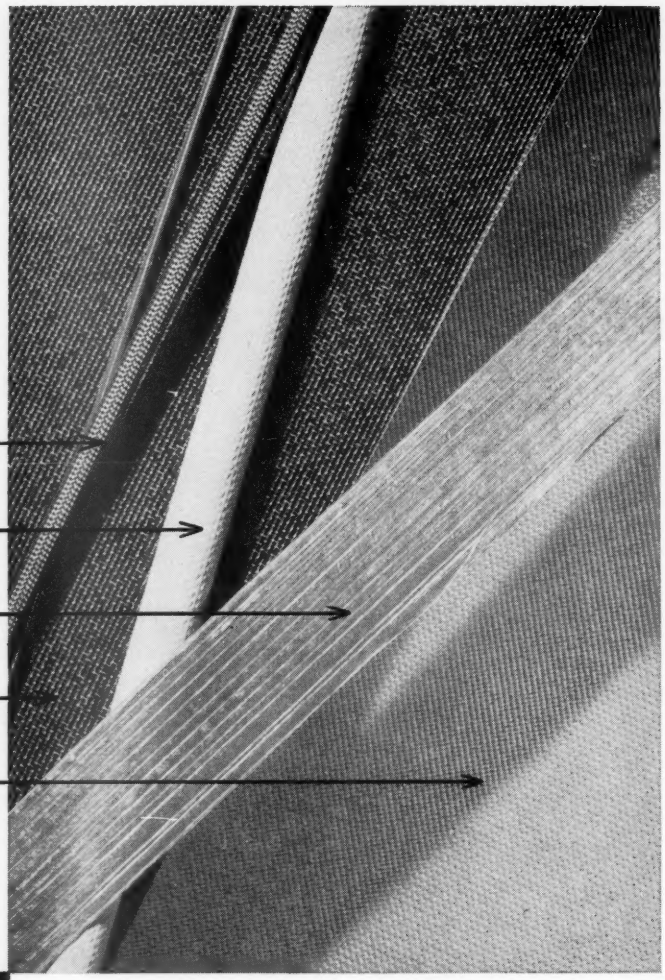
in electrical tapes

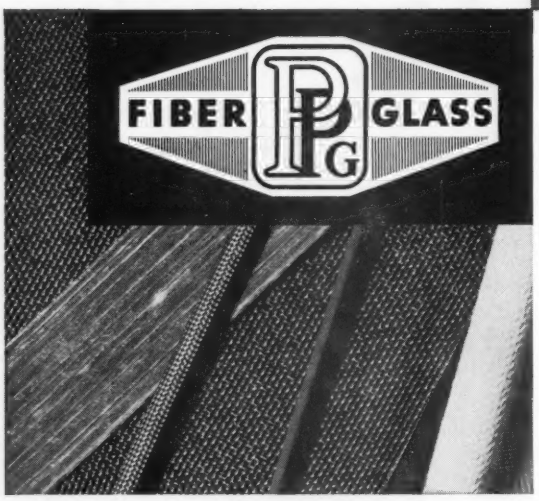
in varnished cloth

in electrical laminates

with

Pittsburgh yarns





Now, fiber glass with all of its excellent properties for electrical insulations is being made to a new level of quality by one of the pioneers in glass-making—Pittsburgh Plate Glass Company.

In the nation's newest fiber glass plant, over 70 years of glass-making "know-how" is being utilized to develop quality controls and processes which insure glass fibers of exceptional uniformity and lower filament breakage.

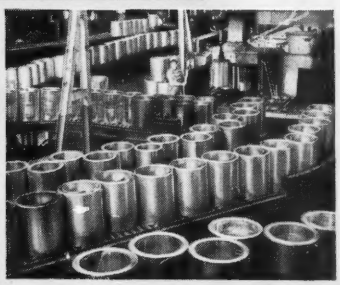
In weaving, braiding or serving, this means higher speeds, less downtime, and improved broad and narrow fabrics, sleeving and braided or wrapped cable. Why not test *new quality* Pittsburgh Fiber Glass yarns soon? Complete arrangements can be made through our executive offices or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia or St. Louis. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

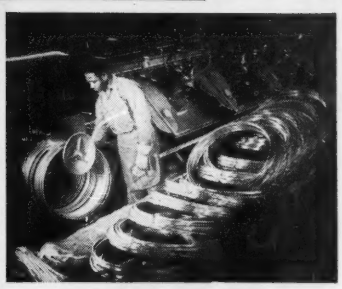
Packaged for all types of weaving and braiding machinery—

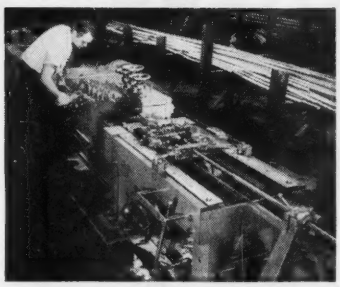
Pittsburgh Fiber Glass yarns are manufactured in various strand sizes, twisted and plied for any desired build-up and packaged to meet the requirements of all types of weaving and braiding machinery.

FIBER PPG GLASS **PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS**

PITTSBURGH PLATE GLASS COMPANY







The prize-winning 16 mm color movie— "THE SCIENCE OF MAKING BRASS"

"In 30 minutes I learned more about making brass than in a day's trip through the mill."

That's a typical reaction to this dramatic Chase film! "The Science of Making Brass" takes you on a guided tour of Chase mills—shows you exciting, full-color close-ups of every step in the making of brass and other copper alloys in the form of sheet, rod, wire and tube. If *you* work with metals, it's an experience you won't want to miss!

"The Science of Making Brass" is a 16 mm, full-color film with a running time of 29 minutes, and will be loaned to you on request. To arrange a showing, clip and mail the coupon below.

It won these PRIZES First Prize, International Competition for Technico-Industrial Documentary Films, Turin, Italy and Venetia Diploma at Venice Festival.

It won this PRAISE "Far superior..." (Colorado manufacturer) "Excellent in every respect..." (Large eastern manufacturer) "Finest ever seen..." (Texas distributor).

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To: Chase Brass & Copper Co., Incorporated
Waterbury 20, Conn. Dept. WWP-1254

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_____ *I would like to arrange for a showing on or about* _____

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POSITION _____

FIRM _____

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CITY _____ STATE _____

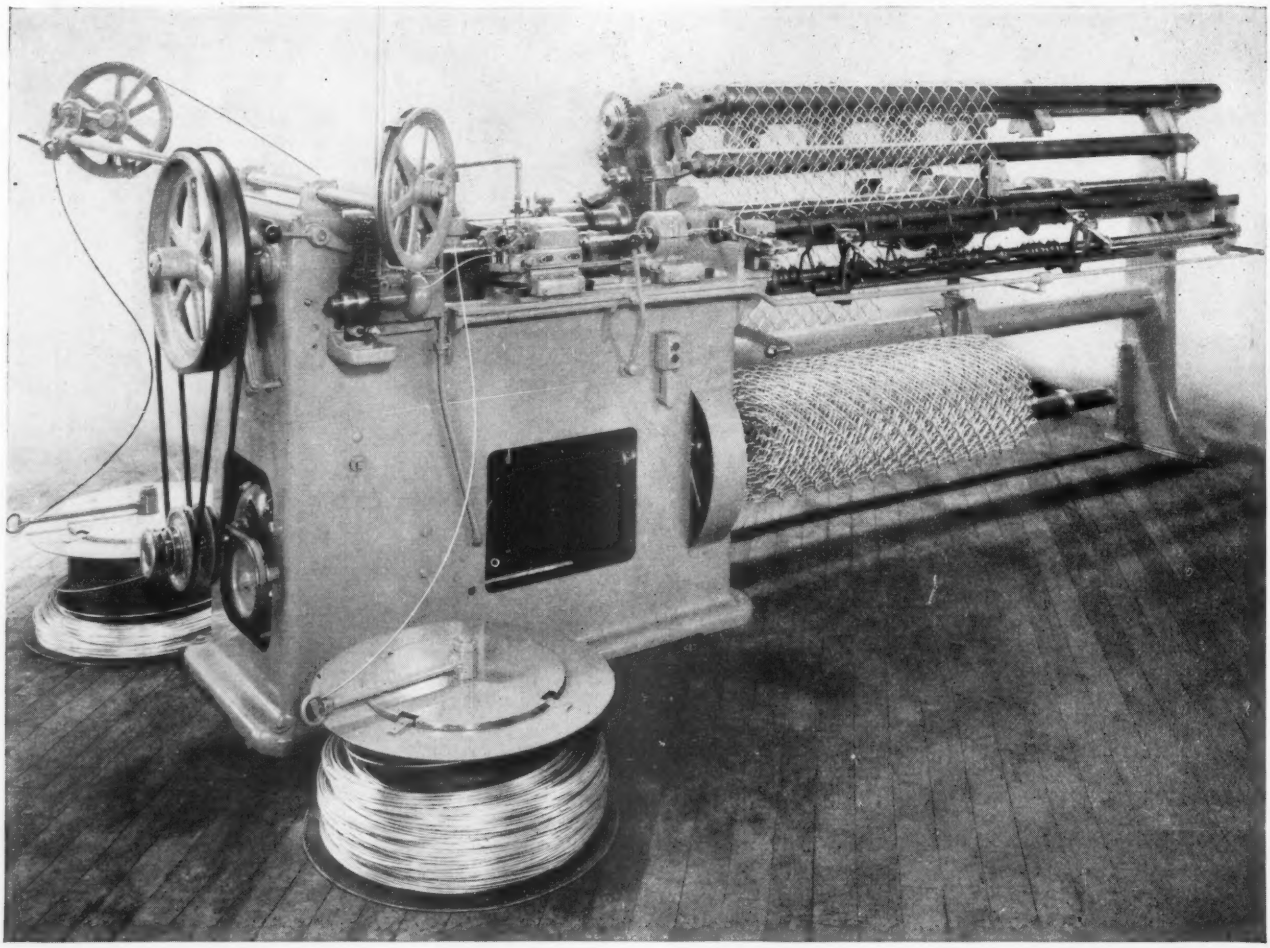
The only MODERN

CHAIN-LINK FENCE MACHINES

now named

"INVINCIBLE"

Wonderful new machines in full operation and available.



Why waste wire, space, power or time any longer. The **INVINCIBLE** will save enough wire in one year of steady use to pay for itself and its operators wages also.

Factory space costs money. The **INVINCIBLE** takes one-third of other machine's space.

High power costs money and adds wear. The **INVINCIBLE** reduces power against output by more than 50%.

Speed counts today. The new **INVINCIBLE** will carry 700 rpm on its wire forming "blade" with ½ second stop for cut-off.

The **INVINCIBLE** has now had many months full working test with such wonderful results that it won its name. Incidentally, its designer's first United States patent on a wire fence machine was granted in 1900.

The **INVINCIBLE** stops its "blade" with absolute accuracy and starts again, both at 120 rpm, making it easy on its special clutch on the blade shaft — but 93% of its weaving is at 700 rpm through an oversize oil immersed friction disk clutch of standard stock type that takes the work. It is long wearing and its disks are easily and cheaply renewed.

With our DeWinders for constant wire supply and our quick roll remover, the **INVINCIBLE** will weave 15,000 square feet of 2" mesh 9 gage fence in 8 hours.

The operating gears and parts of the Modern **INVINCIBLE** are enclosed like all other modern machinery. No need now to risk costly accidents and law suits with wide open gears etc.

Fence makers should see this machine in operation. We would appreciate a letter advising when.

ARTHUR BLASHILL and COMPANY

91 WEBSTER STREET WORCESTER, MASS.

Telephone: WOrcester 7-1937

your

SPECIFICATIONS

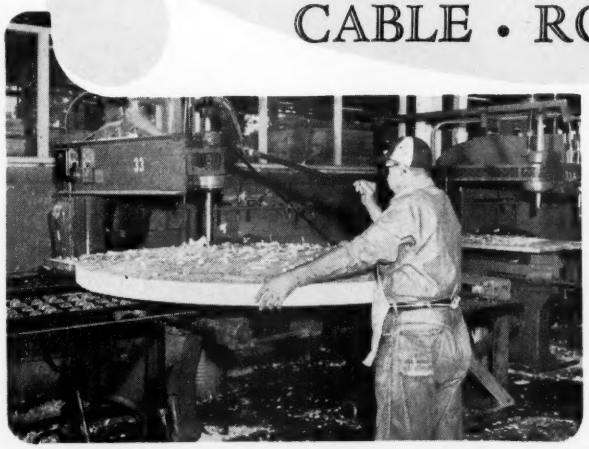
are our

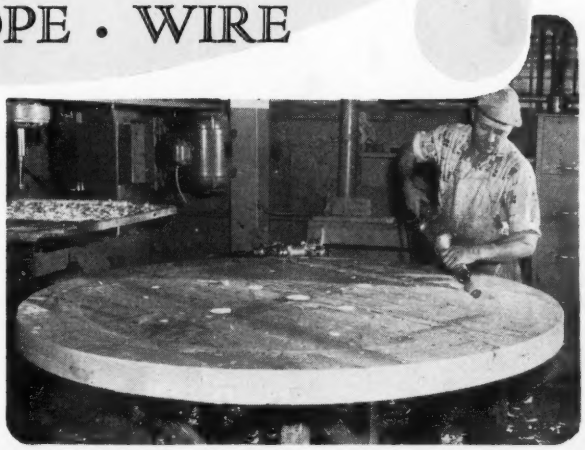
BLUEPRINTS for...

Quality WOOD REELS

for

CABLE • ROPE • WIRE





EVERY type of WOOD REEL, Returnable or Non-returnable, for the WIRE INDUSTRY . . . from 10" to 10' in Diameter.

STRAIGHT-LINE production methods and extensive facilities produce precision-made REELS of highest Quality at prices that make it good business to buy from BRIDGE.

A completely MODERN plant, with the very BEST and FASTEST equipment, much of it specially designed for us, assures you of rapid SERVICE and TOP QUALITY REELS.

HIGH SPEED

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For your interest and acceptance of the new Torrington machines

And for your constructive suggestions which will be most useful to us in the year ahead

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W-525 Automatic Double Bodied Torsion Spring Winder The first machine designed for the general production of this type of spring.

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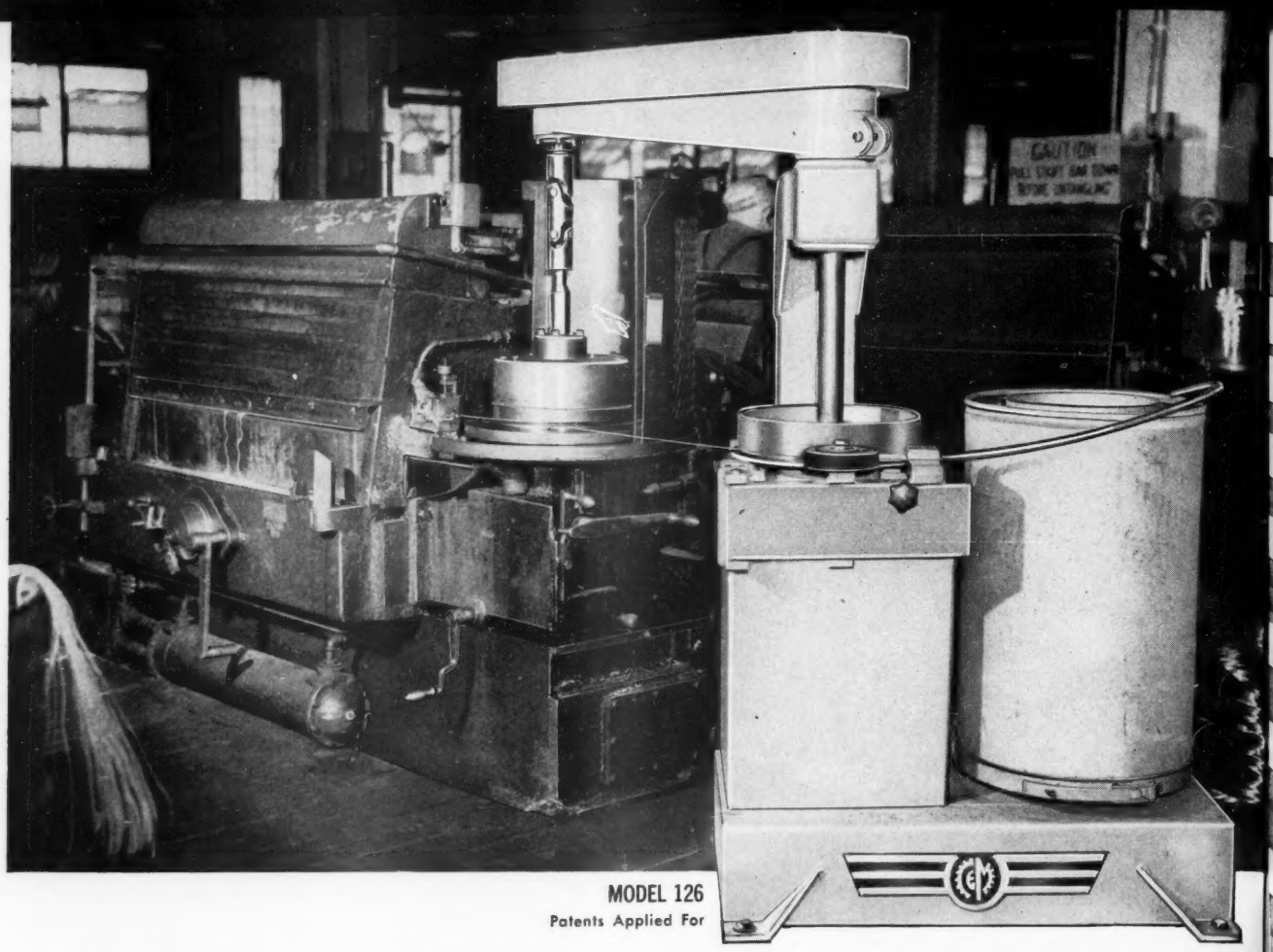

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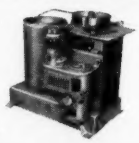
Model 116



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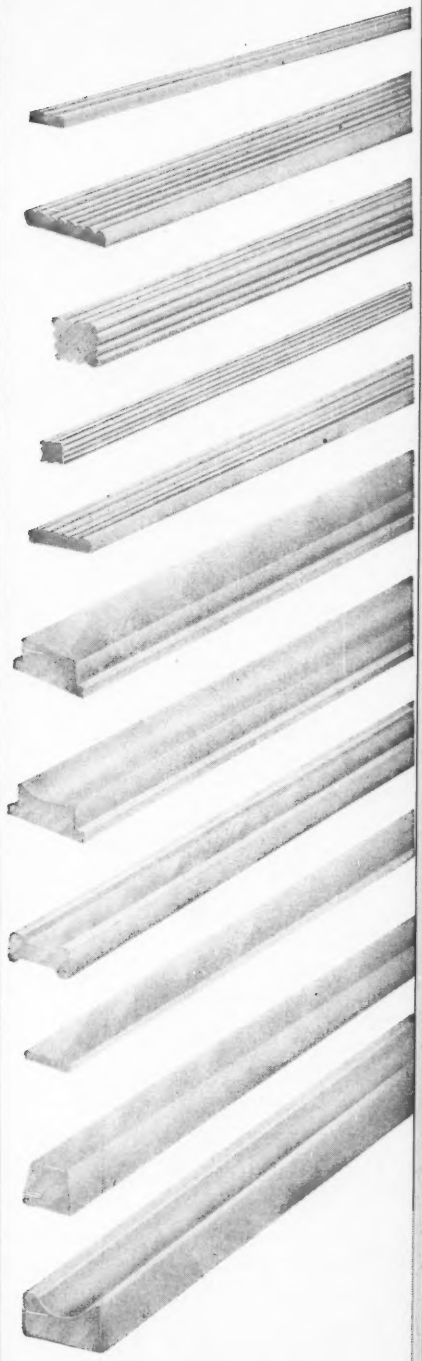

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GRADE NO.	COLOR	CARATS OF DIAMONDS PER GRAM	PRICE PER GRAM
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15	Blue	1.25	4.05
30	Red	1.75	5.70
45	Brown	1.75	5.70
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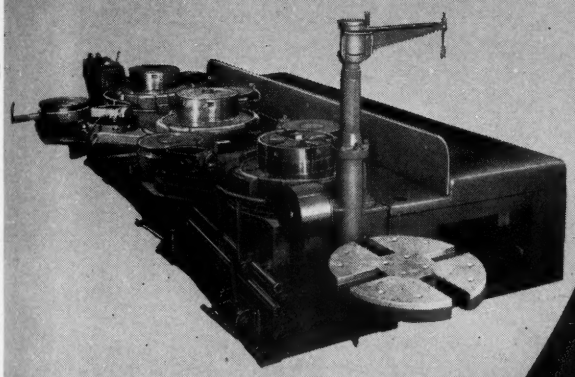
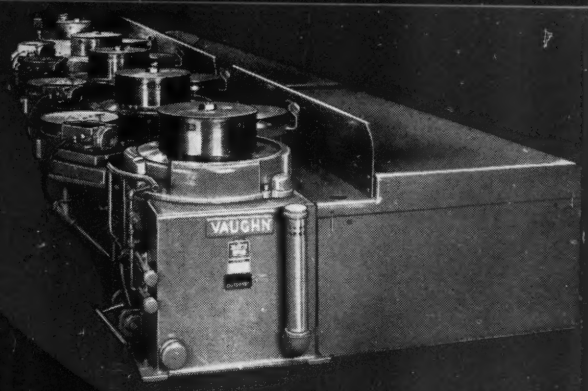


3-Die Scalping Machine



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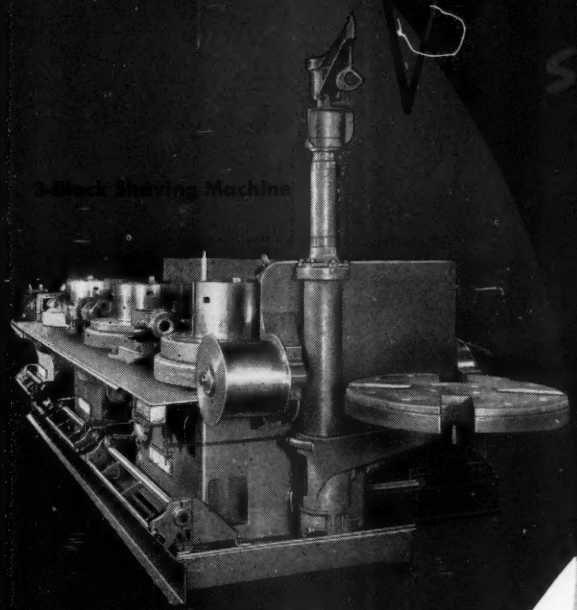
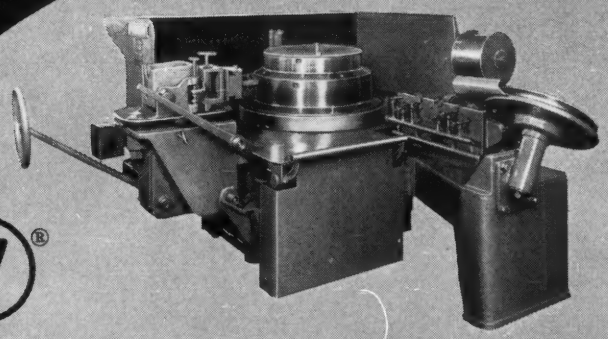


3-Block Shaving Machine



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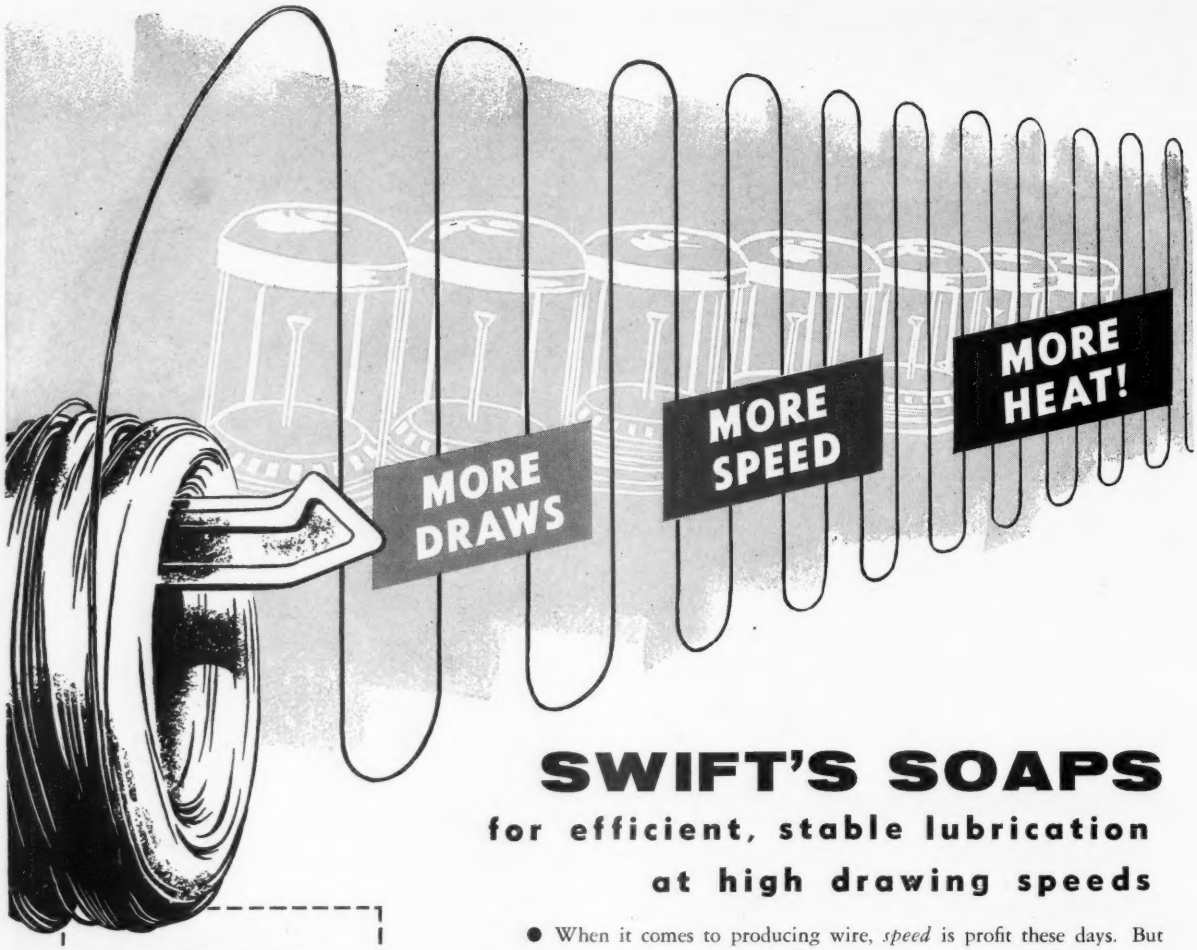

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for efficient, stable lubrication at high drawing speeds

● When it comes to producing wire, *speed* is profit these days. But higher operating speeds, more draws and shorter cooling time between draws mean *heat* too . . . heat that can cut into profits by reducing wear life and the general efficiency of dies and other metal operating components.

That's why the importance of the quality and overall stability of your drawing lubricant *increases* with the speed of your operation—why a dependable lubricant can help you make the *most* of higher, more efficient operating speeds by resisting breakdown under high heat and friction. Swift's wire drawing lubricants are stable because they are produced from the finest raw materials available. They are dependable and efficient because they are produced to uncompromising standards of quality . . . standards established through constant attention to the specific needs of our many customers.

Why not depend on Swift's as a single source for *resourceful* service on a complete line of soaps for wire drawing? . . . 375 distributors throughout the U. S. and Canada can provide prompt delivery, courteous attention to your needs.

Write for details and remember . . .

ONE TRIAL IS BETTER THAN A THOUSAND CLAIMS

IMMEDIATE DELIVERY ON THESE QUALITY SOAPS . . .

- **Powdered White Ribbon**
- **Guaranteed Powder**
- **Snap Heavy Duty Wire (Drawing Powder No. 282)**
- **No. 559 Powdered Soap**

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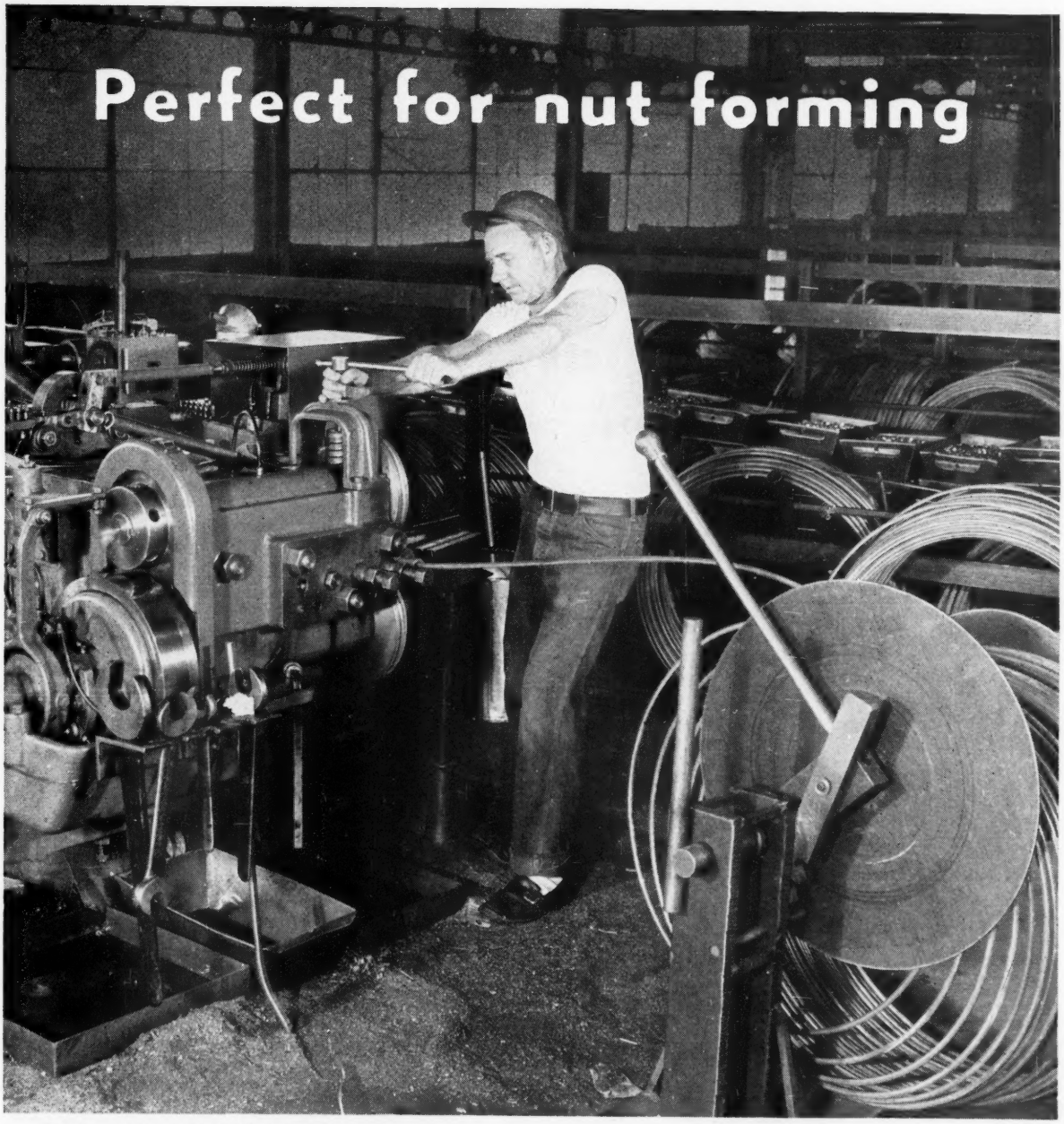
Another of Swift's Products for Industry

SWIFT & COMPANY

Soap Department

CHICAGO 9, ILLINOIS

Perfect for nut forming



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●Youngstown Scrapless Nut Quality Wire is outstanding for its excellent surface and sound internal structure. This uniform high quality results directly from close control of manufacture—from the ore mines clear through to finished product. Thus customers can always be sure that Youngstown wire will stand up under the punishing operations of cold heading, cold punching and thread tapping.

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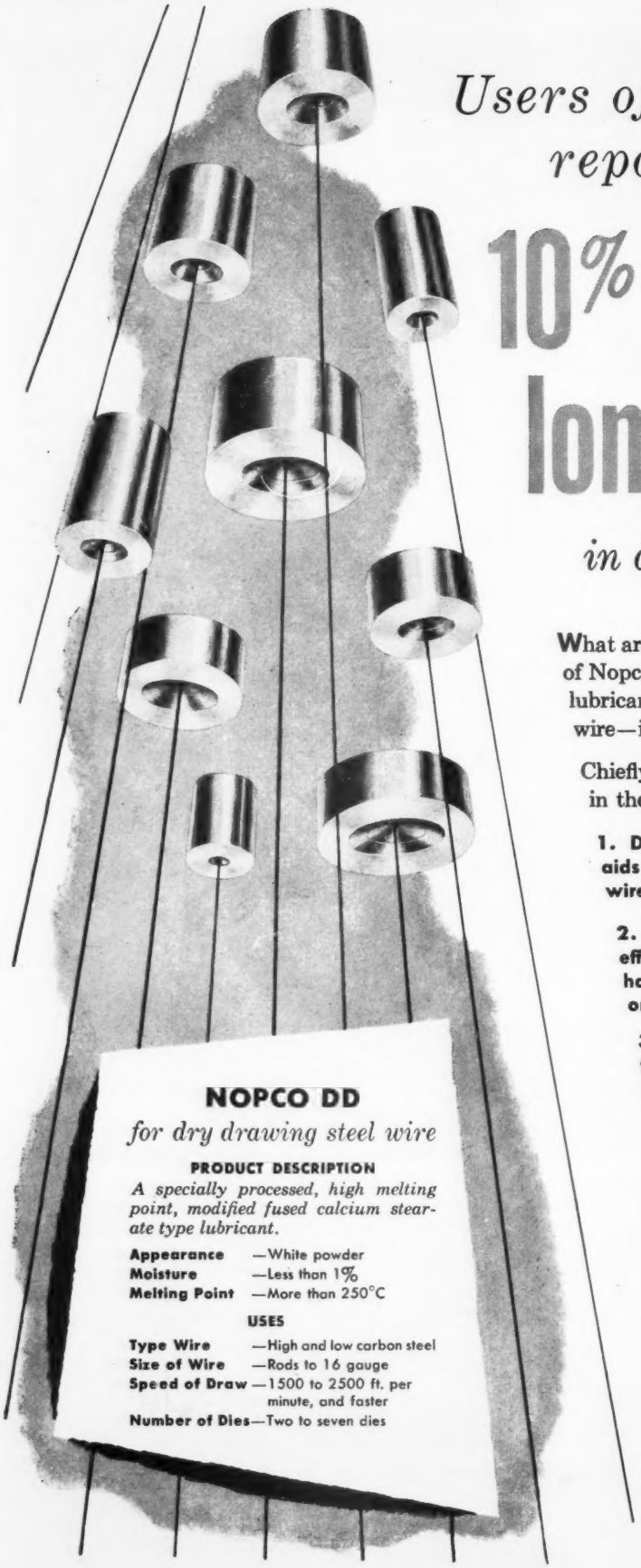

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10% to 50% longer die life

in dry drawing steel wire

What are the reasons why Nopco DD, recent product of Nopco research, is almost certainly superior to the lubricant you are now using for dry drawing steel wire—including galvanized or plated wire?

Chiefly, because it excels all other lubricants in these 3 ways:

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2. **DD's soft film of combined coating and soap effectively separates wire and die—as compared to harsher soaps which have an abrasive action on the die.**

3. **Perhaps most important of all, because the melting point of DD is over 250°C. It does not "burn out" and lose effectiveness like other low melting point soaps often used.**

Though Nopco DD has been available only a year, plant after plant has adopted it—strictly as a result of its performance in their own comparative tests. Isn't it high time *you* tried it? We'll gladly help by furnishing full information and samples for testing. Write today.

NOPCO DD

for dry drawing steel wire

PRODUCT DESCRIPTION

A specially processed, high melting point, modified fused calcium stearate type lubricant.

Appearance	—White powder
Moisture	—Less than 1%
Melting Point	—More than 250°C

USES

Type Wire	—High and low carbon steel
Size of Wire	—Rods to 16 gauge
Speed of Draw	—1500 to 2500 ft. per minute, and faster
Number of Dies	—Two to seven dies

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STEEL TRAVERSES

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for

WIRE • CABLE • WIRE ROPE

Plain finish . . .

Painted finish, or . . .

Galvanized finish (Hot dipped)

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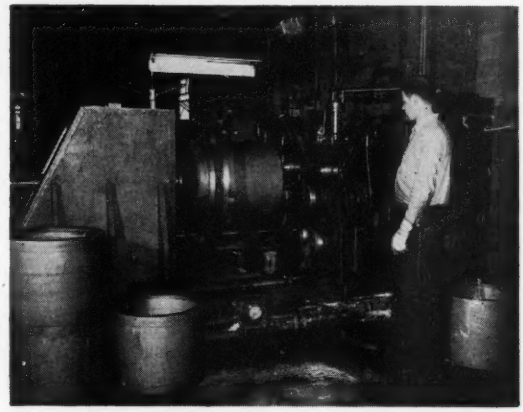


SAVES COST in assembly of reel by eliminating handling of larger number of small parts.

SAVES COST by making repairs easy.

SAVES COST by increasing reel life.

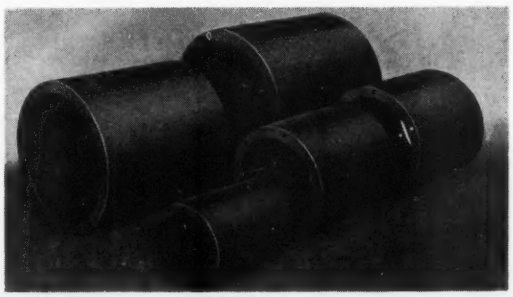
SAVES COST by reducing damage to wire and cable.

LATEST SEMI-AUTOMATIC FLANGING EQUIPMENT AND NEW GALVANIZING PROCEDURE MAKE POSSIBLE LOWEST UNIT COST.

Furnished in steel and aluminum—with flanged or plain ends.

Reinforced construction for heavy duty operations.

- **HUBBARD MAKES A COMPLETE LINE OF ALL STYLES OF FLANGES FOR USE WITH STEEL TRAVERSES.**



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There Are Many Reasons Why V-R Leads The Field!

V-R NEW Cylindrical nib and improved method of assembly insure high degree of concentricity.

V-R . . . First in producing the only Tantalum-Tungsten carbide developed specifically for Drawing Dies.

V-R . . . First to manufacture Carbide Dies with preformed rough cored back relief.

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WRITE TODAY for NEW Vascoloy-Ramet Die Catalog VR-461.

The New V-R Die Catalog gives complete ordering information on all V-R Dies for drawing wire, rod, bar and tube.

The Wire Outlook

With the Annual Convention of The Wire Association now history, we can look back on it with much satisfaction. While the four-day session broke no attendance records, the affair was outstanding for its fine papers, colorful events and a heart-warming spirit of friendliness.

As we enter the last lap of the current year, it is well to note whither we are tending. Business is continuing to make forward strides, with more marked advances along a broad front predicted for next year.

Government: Military spending is expected to remain about level, with state and local outlays for roads and other public improvement projects on the increase. A healthy sign is the continuing effort of the Federal government to get out of competition with private enterprise.

Industry: Portents are good. Employment is rising. The steel industry hopes to maintain an average output of 75% of capacity in 1955, although it should be noted that it rose to 78% in the latter part of October. Modernization, particularly among the smaller operators, who have lagged behind in bringing productive equipment up-to-date, is beginning to gather momentum, as they strive for a more favorable competitive position. But, the trend will continue with the big manufacturers too.

Building: Home building estimates are being revised upwards, with an increase of 5% or more now looked for in 1955. More home modernization is also anticipated.

Automotive: Manufacturers are hoping for larger sales. If their expectations are realized, it will have a far-reaching effect on the entire economy.

Consumers: John Q. Public is saving more and is generally pretty well heeled and not inclined to pinch pennies where new and better products are concerned.

Inventories: In the last quarter these have dropped by 2 billions and are 65.3 billions under this time last year. Corresponding to this, corporate cash reserves have increased by 900 millions since March to a healthy 28.7 billions.

With the copper strikes settled, tensions among non-ferrous consumers has eased considerably. Consumption is high. To allow industry to catch up, the ODM has deferred further stockpiling for two months. Stepped-up buying is in evidence for copper and copper-base metals.

September was the month in which wire sales began to pick up. Sales of rod were better than 30% over those of July. Merchant wire sales have been leading the procession, but will taper off during the winter. This is more than offset by an increase in manufacturers wire sales. Wire for automotive uses is markedly up. Cold heading wire, one of the indices of industrial activity, is enjoying an up-surge that is expected to continue through the coming year. Road reinforcing fabrics have dropped in sales, but the market outlook for 1955 is bright. Nails and nail wire sales are strong. Stainless and resistance wire orders are marking time. Altogether, including electric wire and cable, the broad picture is one of encouragement.

While the outlook is promising, it will be one in which continuous adjustments will probably have to be made, for we are still under the pressure of mild inflationary forces, which will be paralleled by demands for wage increases at regular intervals.

1955 business, it is estimated, should be about 5% better than this year, which would make it second only to 1953. 1956, as far as the forecasters feel they can safely predict, may even approach boom levels.

In the meantime, it is enough to be grateful that business is moving in the right direction.

—from the Editor's Desk

to the friends we've made
and the ones we hope to make—
a very

MERRY CHRISTMAS

—and a prosperous New Year!

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WIRE
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A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29. DECEMBER, 1954 No. 12

Prestressing Wires — Stress-Relaxation and Stress-Corrosion Up To Date

by Gordon T. Spare, Project Engineer
Research Laboratory
American Steel and Wire Division
United States Steel Corporation
Cleveland, Ohio

The past five years have seen a rapid growth in the tonnage of high strength steel wire required for prestressing applications. The somewhat unexpected accession of this business found the steel wire industry unable to provide certain data of importance to the prestresser. Steel wires had not been called upon to sustain such high loads (better than 125,000 p.s.i.) in structural applications, and information was lacking as to long-time stability under these loads. Only limited attention had been given to the possibilities of sudden fail ures in prestressing wires because of corrosion, stress-corrosion, notching, fatigue, and so forth.

★ ★ ★

The industry has moved rapidly toward resolution of these problems. Most of the results of the work are to be found in the recent contributions of Godfrey and Everling.

Stress-Corrosion

Wherever steel is used for prestressing concrete, harmful effects of chemical attack aided by high stress must unquestionably be guarded against. Irregular generalized corrosion leading to notch failure, the embrittling absorption of hydrogen from acid solutions, and/or the extremely localized attack known as stress-corrosion cracking, are all distinct possibilities. Careful attention must therefore be given to thorough protection of the steel from atmospheric or ground waters.

Gordon T. Spare

A paper presented at the Annual Convention of The Wire Association on November 9, 1954, at Detroit, Michigan. The paper gives information on the properties of wire used as tendons in prestressed concrete. Importance of protection against corrosion is accented.

★ ★ ★

In a paper read by **W. O. Everling** before the 1954 general meeting of the American Iron and Steel Institute, the author concluded that, among the common salt anions, only the nitrate caused typical stress-corrosion cracking. All types of high strength wires, whether cold drawn, stress-relieved, or oil tempered, stressed by simple bending and immersed in the corrosive solutions, were shown to be susceptible to this type of attack.

★ ★ ★

This paper can be referred to for results of a large variety of confined bending stress-corrosion exposures. Photographs of typical breaks and micrographs of cracks illustrate the characteristic frac-

ture types, diagonal in the cold drawn and normal to the axis in the oil tempered wires. This confined bend test technique did not, however, provide a sensitive means for determining the actual time of onset of cracking. To fill this need we employed a simple and reproducible method which we call the free-loop test. This test has uncovered information of considerable interest.

The Free Loop Test

Briefly, the test comprises looping wires around mandrels three times their diameters, permitting them to spring back, then exposing to corrosive media for various lengths of time. Damage is detected by failure in unlooping.

★ ★ ★

Figure 1 is an approximation of the residual stresses in such loops. It can be seen that extreme outer fiber stress can reach a rather high figure.

Cracking occurs on the inside of the loops, where the surface layers are in tension after spring back. Photographs of typical cracks in an oil tempered wire at various stages in the process are shown in Figure 2. Cracks appear to begin at pits which have developed at persistently anodic locations. In most cases, failure occurs within a rather narrow time range. Some of the more protracted failures, say, in excess of 100 hours may be more attributable to generalized corrosion than to cracking. A number of the more interesting observations are summarized in the next two figures.

★ ★ ★

3A - Oil tempered versus cold drawn. A pronounced difference is evident with the oil tempered failing at about one hour and the cold drawn still ductile at over 1000 hours. This difference cannot be regarded as strictly quantitative because generalized corrosion would eventually cause some stress reduction in the cold drawn loops. It is probable that loops of larger cold drawn wires would show earlier cracking.

★ ★ ★

3B - Effect of electropolishing. Surface improvement by electropolishing before looping defers onset of cracking by some five or six hours. Many potentially anodic areas are undoubtedly removed by this treatment.

★ ★ ★

3C - Looping after exposure. In a most surprising result, the oil tempered wire failed almost as readily in the unlooped condition as in the looped. We first assumed that this was an indication of the relative unimportance of stress level, but more careful thought pointed to the presence of extremely high surface stresses remaining from the tempering operation, even with the most carefully controlled laboratory conditions.

★ ★ ★

3D - Effect of surface stress-relief. We verified this by removing

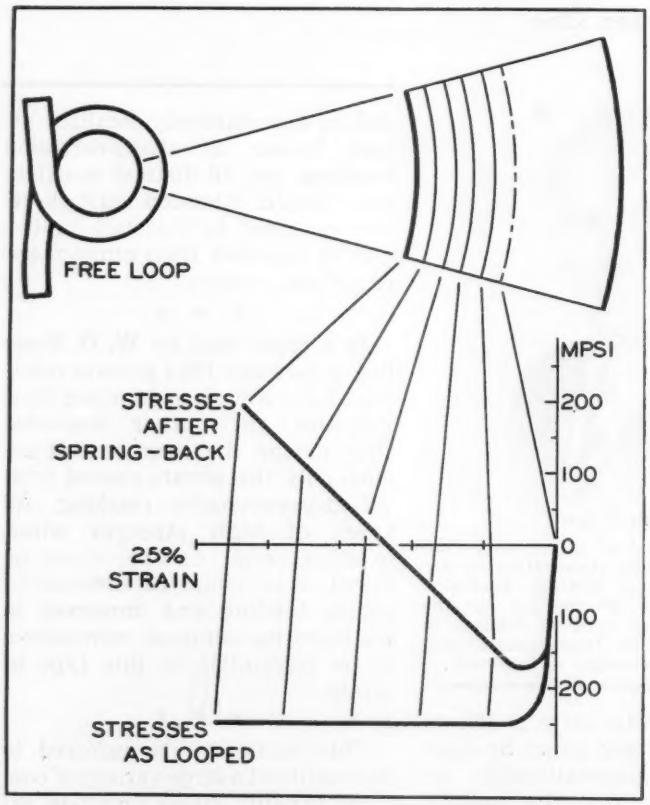

FIGURE 1 – APPROXIMATE STRESSES IN FREE-LOOP STRESS CORROSION SAMPLES.

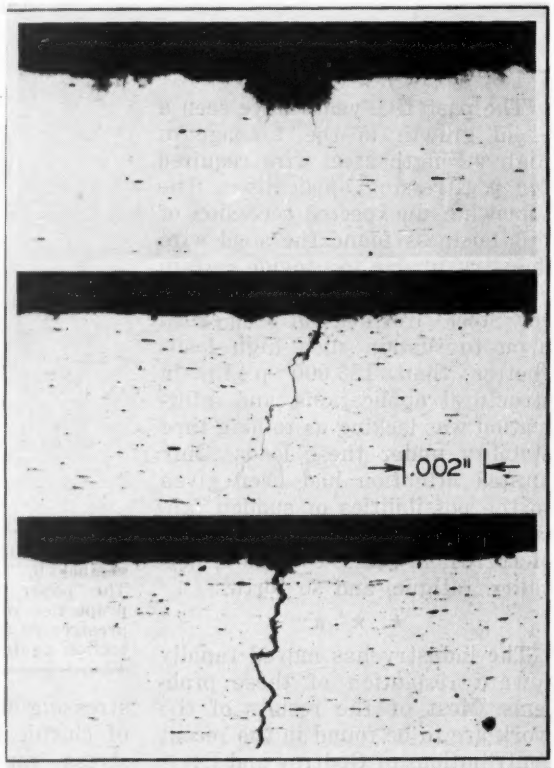

FIGURE 2 – STRESS-CORROSION CRACKS IN FREE-LOOPS. 0.66%C .070" WIRE IN HOT 1.0 N NH_3NO_4.

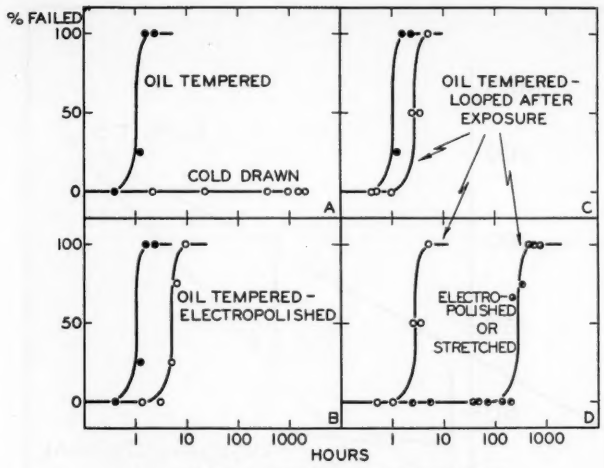

FIGURE 3 - BREAKS IN OPENING LOOPS IN 0.66% C .070" WIRE AFTER EXPOSURE TO HOT 1.0 N NH_4NO_3.

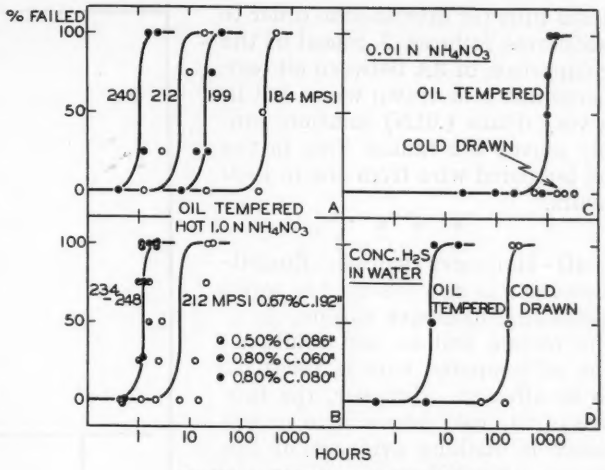

FIGURE 4 - BREAKS IN OPENING LOOPS AFTER DIFFERENT EXPOSURES. 0.66% C .070" WIRE EXCEPT WHERE NOTED.

the high surface stress before exposure, either by pre-stretching into the plastic range, or by electropolishing. Failure was postponed to about 200 hours.

★ ★ ★

4A - Tensile strength. Further evidence of the importance of stress is given by this series, in which the wire was tempered to several different levels of ultimate tensile strength. Maximum outer fiber stress in the free loops is roughly proportional to the strength and time to unlooping failure is lengthened accordingly.

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4B - Carbon and size effects. Four wires (including the wire of 4A) ranging in carbon content from 0.50% to 0.80%, and heat treated to approximately the same tensile strengths, all broke at about one hour. Another considerably larger wire (0.192") with an ultimate of 212,000 p.s.i. took significantly longer to fail in unlooping. Scatter is greater in this larger wire, but exposure life correlates well with the .070" wire of figure 4A at about the same tensile strength.

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4C - Dilute corrodant. Hot, fairly concentrated (1. ON) ammonium nitrate solutions were used in all

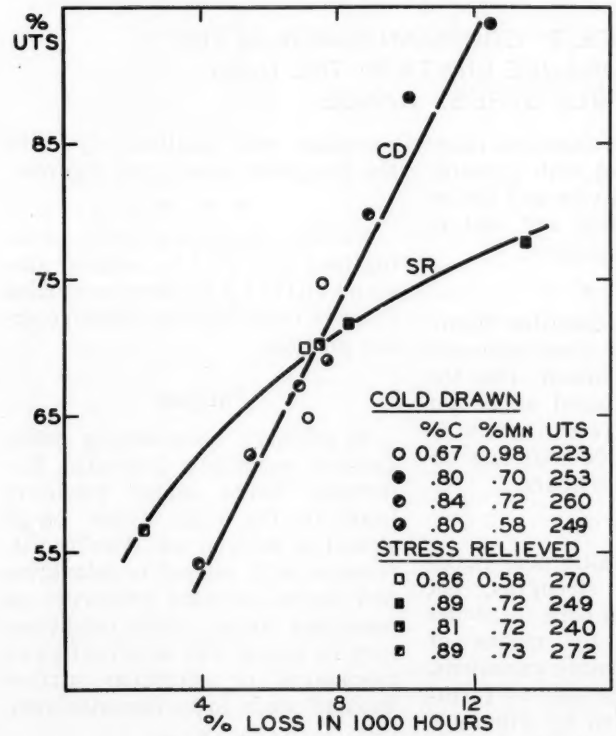

FIGURE 5 - RELAXATION OF SEVERAL HIGH-STRENGTH 0.196" WIRES FROM VARIOUS STRESS LEVELS.

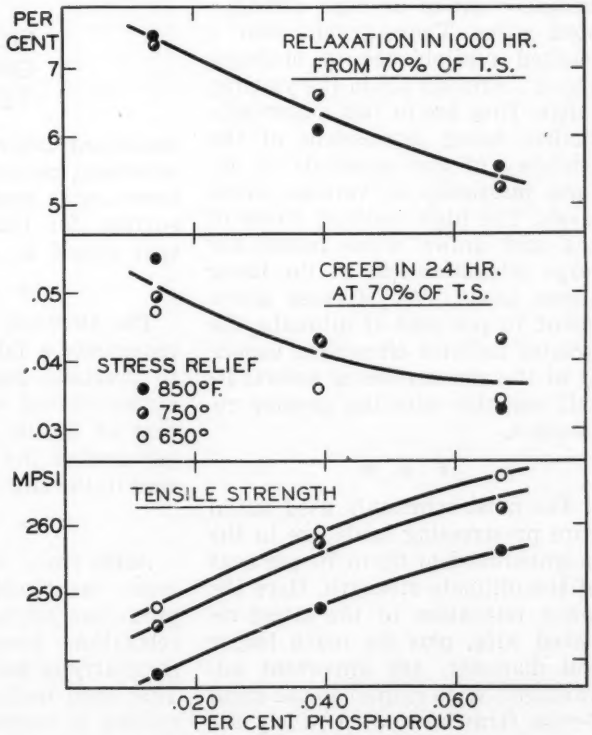

FIGURE 6 - EFFECT OF PHOSPHOROUS CONTENT ON PROPERTIES OF AN 0.81% C 0.196" WIRE.

tests thus far described in order to accelerate failures. A repeat of the comparison of 3A between oil tempered and cold drawn wires, but in a very dilute (.01N) solution, simply moves the failure time in the oil tempered wire from one to 1000 hours.

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4D - Hydrogen sulfide. Embrittlement was also observed in water containing hydrogen sulfide. As in the nitrate and in acid solutions, the oil tempered wire is the first to be affected. However, the failure of the cold drawn wire in 100 hours is striking evidence of the danger of sulfides.

Relaxation

At the high stresses necessary in wire prestressing, yielding or plastic flow in the wire continues after loading. Under the nearly constant length conditions of a concrete member, this yielding shows itself in a progressive loss in load, or relaxation.

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Figure 5 summarizes long time stress relaxation data for a representative group of high strength steel wires. These graphs bear a marked resemblance to ordinary stress strain curves in the yielding range. They are in fact generically similar, being expressions of the tendency of the materials to deform plastically at various stress levels. The high residual stress of the cold drawn wires makes for large relaxation loss at the lower stress levels. At stresses above about 70 per cent of ultimate, the greater uniform elongation capacity of the stress-relieved asserts itself and this wire has greater relaxation.

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The most commonly used initial wire prestressing loads are in the neighborhood of 60 to 70 per cent of the ultimate strength. Here the lower relaxation of the stress-relieved wire, plus its much larger coil diameter, are important advantages. With respect to the small 7-wire strands used so widely for pretensioning, the choice is not so obvious. In this case, straightness is not so pressing a matter, but the somewhat better relaxation characteristic, combined with probable lower notch sensitivity and better surface for bonding, are factors that should be considered.

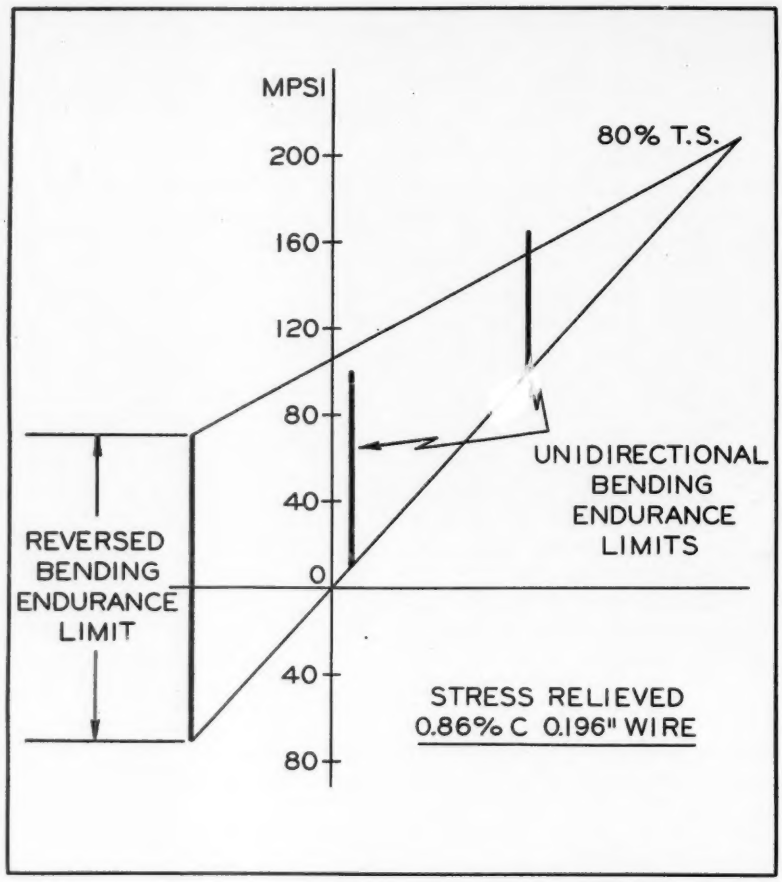

FIGURE 7- GOODMAN DIAGRAM FOR ENDURANCE LIMITS IN THE HIGH TENSILE STRESS RANGE.

★ ★ ★

The 1000-hour relaxation figure represents a fairly close approach to practical equilibrium. For the stress-relieved material at 70 per cent of tensile strength some 80 per cent of the 1000-hour loss occurs in the first 100 hours.

★ ★ ★

Aside from working near maximum practicable strengths, not much has yet been done to reduce relaxation losses by means of chemistry or processing variations. That such methods may be forthcoming is suggested by Figure 6, which records the effect of varying the phosphorous content of the steel. The short-time creep tests correlate well qualitatively with the long-term relaxation figures.

★ ★ ★

Further studies and understanding may also lead to reduced susceptibility to stress-corrosion through control of the manufacturing practice.

Fatigue

In addition, wire testing under dynamic conditions is needed. Endurance limits under pulsating loads in the high stress range should be determined. Possible differences with respect to relaxation and stress-corrosion properties as measured under static conditions may be found. The notch effect of mechanical or corrosion surface damage needs to be demonstrated.

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Our own work in this area is in

(*Please turn to page* 1492)

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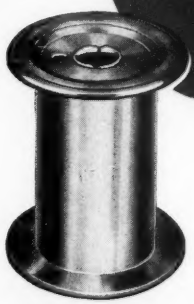
*Reg. U. S. T. M.



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4¼"	3" 3¼" 3½"	3¼"	.635"
4½"	3" 3¼" 3½"	2½"	.635"
4½"	6"	2½"	.635"
5"	2¾" 3"	3.880"	.531"
6"	3" 3¼" 3½"	3½"	.635"
6"	3" 3¼" 3½"	3½"	3"
6"	6"	3" or 3½"	.635"
6"	6"	3½"	3"
6½"	3" 3¼" 3½"	3½"	.635"
6½"	3" 3¼" 3½"	3½"	3"
6½"	6"	3½"	.635"
6½"	6"	3½"	3"
7"	3" 3¼" 3½"	3½"	.750"
7"	6"	3½"	.750"
8"	3½" 6" 6½"	4"	3" or 3¹³/₁₆"
8¼"	3½" to 7½"	4"	3.630"
10"	6"	5"	Optional
12"	6"	6"	Optional

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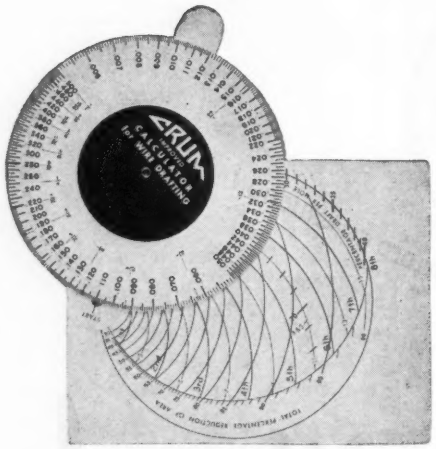

Front view of Crum Calculator.

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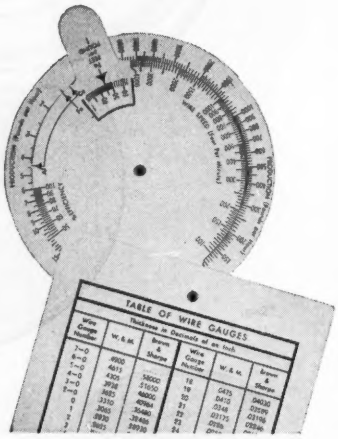

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Electrotinning of Copper Wire from the Stannous Fluoborate Bath

by A. E. Carlson
Technical Service
General Chemical Division
Allied Chemical & Die Corporation
Edgewater, New Jersey

Dr. Carlson presented this paper at the Annual Convention of The Wire Association in Detroit on November 9, 1954.

Introduction

In recent years considerable interest has been shown in the electrotinning of copper wire as a substitute for the host dip process. Plating has been found to give more uniform deposits with closer control of thickness, thereby affording considerable savings in tin. For example, coating final wire sizes by the hot dip process results in thicknesses of about eighty to one hundred millionths of an inch, which is heavier than necessary, while electroplating can produce deposits of any order of thickness. Twenty to thirty millionths of an inch usually is sufficient. This control of thickness represents a saving of approximately two-thirds of the tin.

★ ★ ★

Tin deposits from the fluoborate bath are fine-grained and of matte white color. The plated wire may be readily drawn through dies for burnishing and for the production of finer size wires. For example, a No. 20 wire may be plated with one hundred millionths of an inch of tin and then drawn through a number of dies to a No. 34 wire (a reduction of 80% in diameter), followed by annealing at a speed of 5000 feet per minute. Hot tin dipped wire is not drawn, due to the non-uniformity of thickness and structure of the tin coating.

★ ★ ★

Tin deposits from the fluoborate bath have excellent solderability and good shelf life.

Process and Equipment

The following description covers typical wire plating equipment that has been developed for use with the Stannous Fluoborate bath. Other features may be incorporated in new designs or other wire plating lines may be converted for use with the fluoborate solutions.

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1. Electro-alkali Clean — This is a steel or stainless steel tank, 6-8 feet long, including overflow sections at either end. The alkaline solution is heated in a storage tank attached to the cleaner tank and circulated by a deep well-type pump so it flows over slotted dams at the ends of the tank and back to storage. Sodium cyanide at 1 oz/gal may be added to the solution to facilitate cleaning. The wire is made the anode and the tray in the tank the cathode.

2. Water Rinse — This is a stainless steel tank 6 feet long including overflow sections at either end, and contains a tray with cypress or redwood strips 1½ inches high by one inch thick bolted to it, thus providing troughs through which the wire travels counter-current to jets of water.

★ ★ ★

3. Acid Pickle — This is a steel or stainless steel tank, lined with rubber or Koroseal, 6-8 feet long including over-flow sections on either end. Should it be desired to make the acid an electropickle, a 2.5% fluoboric acid solution is employed, making the wire the anode and carbon plates in the holding tray the cathode. If the acid is to be used merely as a soak pickle, a concentration of around 10% fluoboric acid is employed. The circulation of this tank is the same

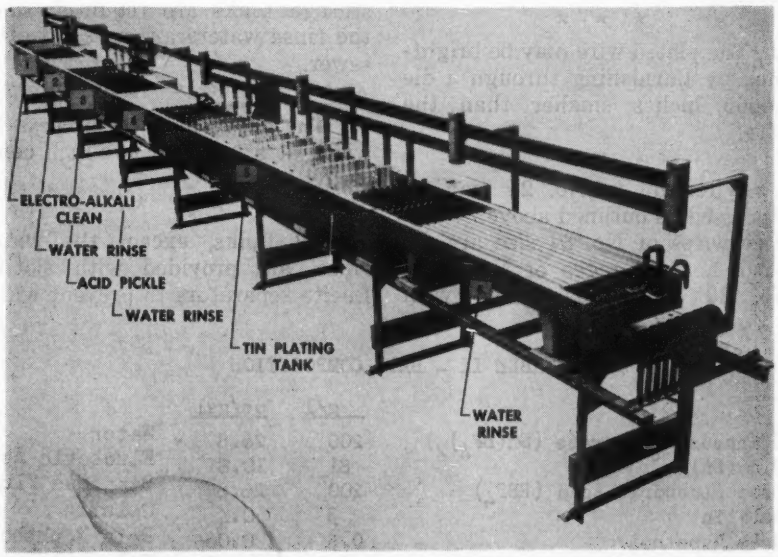

Figure 1. Photograph of the Line.

as the electro-alkali cleaner.

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4. Water Rinse — This tank is the same as No. 2.

★ ★ ★

5. Tin Plating Tank — This tank is 14 feet long including overflow troughs at either end, and may be steel or stainless steel lined with rubber or Koroseal. The storage tank is attached and is equipped with two deep well-type pumps to circulate the bath. Slotted dams are placed at either end of the tank to maintain solution level and permit overflow to return to storage. The tray on which the tin anodes are placed should also be covered with rubber or Koroseal, except the inside portion which makes electrical contact.

★ ★ ★

6. Water Rinse — This tank is the same as No. 2.

Notes

1. Following each of the above tanks, are provisions for wiping the wire with air and/or dies. These prevent "dragout" and "dragin" from one tank to another. The most important are those before and after the tin plating tank, inasmuch as economy of operation is obtained by keeping the loss of the plating solution to a minimum. Diamond dies set in Lucite, having a diameter of 0.0005 inches greater than the wire, following each tank have been employed for this purpose.

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2. The plated wire may be brightened by burnishing through a die 0.0005 inches smaller than the wire.

★ ★ ★

3. Wires up to No. 24 may be processed as outlined above. When finer wires of No. 34 size are desired, heavier gages of No. 12 to No. 20 should be plated with heavier deposits of tin and subsequently drawn to the final size and annealed.

TABLE I

Size Wire No.	14	20	20
Diameter, Inches	0.06408	0.03196	0.03196
Plating Length, Feet	12	12	12
Area, Square Feet	0.2010	0.1002	0.1002
Feet per Minute	500	500	350
Amperes per Wire	117	58.6	133
Amperes per Square Foot	583	583	1350
Tin Thickness, Inches	0.00003	0.00003	0.0001

★ ★ ★

4. As regards electrical contacts, the system may be operated by completing the circuit through the cathodes in the alkali and acid tanks where the wire is positive, and through the anodes in the plating tank where the wire is negative. In this manner, no direct contacts on the wire are required. However, experience has shown that when plating heavy tin deposits, on the order of 0.0001 inches on a No. 20 wire, it is advisable to install heavy copper shoes (half round ⅜" stock with 0.001 inches chrome plate) on either end of the tank as electrical contacts.

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5. The above line including storage tanks for the alkali, acid and tin plating units is about three feet wide, one and one half feet deep and 44-46 feet long. The water rinse tanks are twenty-two inches wide by ten inches deep. No water storage tanks are required, since the rinse waters are passed to the sewer.

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6. The above line will process 10 wires at a time, on two-inch centers.

★ ★ ★

7. All tanks, except the water rinse, are provided with slotted Lucite separators to prevent whipping of the wire when travelling through the line.

Speeds of Plating

Table 1 above will give some idea of the possible plating speeds and current densities.

Formulae for calculating speeds, current density, etc. are as follows:

1. **Amperes per Wire = 0.122 dTS**
   d = Diameter in inches
   T = Thickness of tin in millionths of an inch
   S = Speed of wire in feet per minute
2. **Current Density = 0.466 TS÷L**
   T = Thickness of tin in millionths of an inch
   S = Speed of wire in feet per minute
   L = Effective tank length in feet
3. **Area of Wire in Square Feet = 0.2618 dL**
   d = Diameter in inches
   L = Length of wire in feet

Bath Make-Up

The plating solution, Table II, prepared from the stannous fluoborate concentrate, has been found suitable.

★ ★ ★

Anodes: Pure cast tin anodes are recommended.

Preparation of Bath

To prepare a 100-gallon bath of the foregoing composition, the following amounts of ingredients should be used in the order given.

(*Please turn to page* 1488)

TABLE II - BATH COMPOSITION

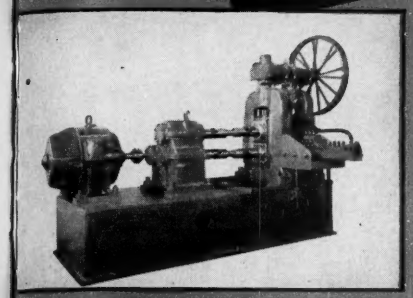
	g/l	oz/gal
Stannous Fluoborate ($Sn(BF_4)_2$)	200	26.8
Tin (Sn)	81	10.8
Free Fluoboric Acid (HBF_4)	200	26.8
Gelatin	3	0.4
Beta Naphthol	0.5	0.065
Catechol	0.5	0.065

TABLE III

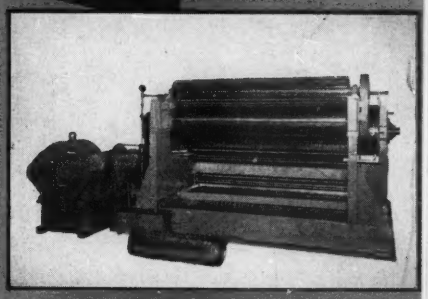
	Lbs.	Gals.
Water	356	42.7
Fluoboric Acid (48%)	350	30.7
Stannous Fluoborate Conc.(47%)	355	26.6
Gelatin	2.5	-
Beta Naphthol	0.4	-
Catechol	0.4	-

LOOK TO Wean FOR WIRE MACHINERY

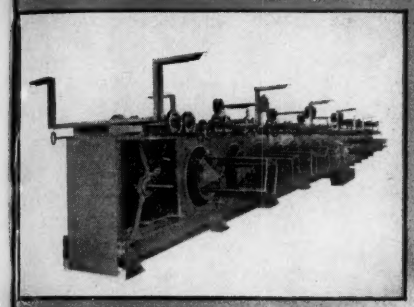
Process OR Product



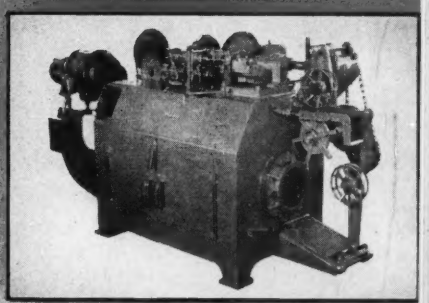
2—Hi Wire Flattening Mill



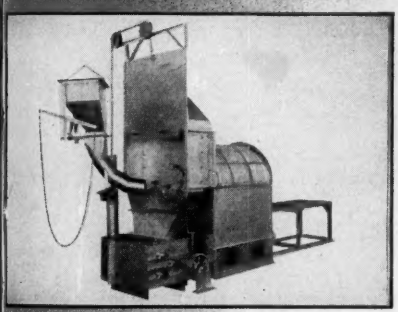
Hexagon Netting Machine



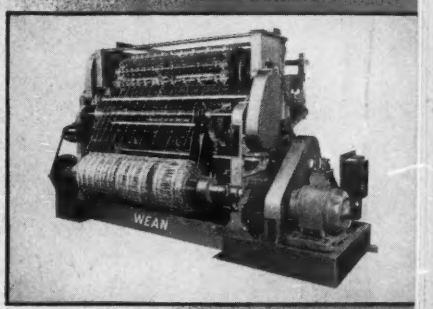
Wire Galvanizing Take-Up Frame



2 or 4—Point Barbed Wire Machine



Nail Galvanizing Unit



Hinge — Joint Fence Machine

In the past few years tremendous progress has been experienced in the field of wire machinery. Production speeds have been tripled and quadrupled. Product quality has been greatly improved. Machines have been made easier to operate and maintain.

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Wean Equipment Corporation
CLEVELAND, OHIO

Continuous Wire Drawing and Packaging

by William H. Richardson, Vice President
The Driscoll Wire Company
Shelton, Connecticut

This paper was presented at the Annual Convention of The Wire Association in Detroit, Michigan, on November 10, 1954.

It is now nearly four years since the first model of a Payoff Barrel was constructed. It was a very simple device, but its development has completely changed our Company's ideas regarding wire manufacture. It has also resulted in similar changes in the minds of most of our customers, as well as a number of concerns who were formerly not users of our product.

★ ★ ★

Our original purpose in developing the Payoff Barrel was simply to provide us with a sales tool. We felt that if this means of dispensing wire was an advantage to the consumer we could increase our business in the fine and specialty wire field, which is always difficult to accomplish where a definite improvement in quality cannot be clearly demonstrated, and where price reductions are impractical.

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We were greatly surprised at the immediate and favorable response by wire users. In fact we were somewhat embarrassed by demands for Payoff Barrels before we had developed the techniques and equipment necessary to produce in quantity.

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It has become rapidly apparent that the advantages to the consumer were not the only benefits to be derived from this new development. We operate a small conversion mill with a considerable variety of sizes and grades, and very few long runs, which demonstrates very well the economies of the Payoff Barrel as a process tool in the wire mill.

★ ★ ★

The Payoff Barrel, or Payoffpak, as it is now known has been illustrated in both articles and advertisements in "Wire & Wire Products" and nationally advertised by the Continental Can Company in such publications as "Time", "Business Week", and "Fortune". However, a short description of its construction and use in each of its phases, as a processing tool, shipping container, and dispensing device, may be interesting.

★ ★ ★

Our original working model was based on a converted Leverpak fibre drum. This proved to be very satisfactory and led to the eventual transfer of our patent rights to the Continental Can Company, who now offer licenses without charge to manufacturers of wire and wire machinery, which cover the use of the containers, equipment for loading them, and the system itself. The Leverpak drum is responsible to a large extent for the success of the Payoff Barrel system as the drum being used as part of wire drawing or processing machinery must be accurately made and have the strength and balance necessary for operation at high speeds with heavy loads.

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Before entering into a description of the Barrel let me say that when sizes, speeds, quantities, and so forth are mentioned they are by no means considered to be practical limits for operation, but merely represent what we have actually used in production.

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These drums of course are available in a wide range of sizes, but the standard Payoffpak is 30" high by 20" in diameter. A core of approximately 12 3/4" outside diameter is firmly riveted and glued

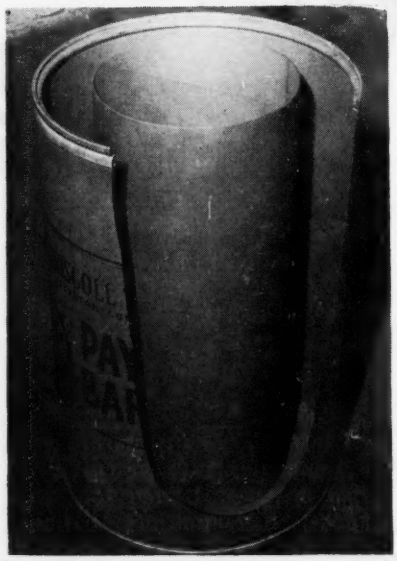

Figure 1.

to the bottom of the drum, and must be centrally located to run true with the outside of the Payoffpak. An inside cover is provided

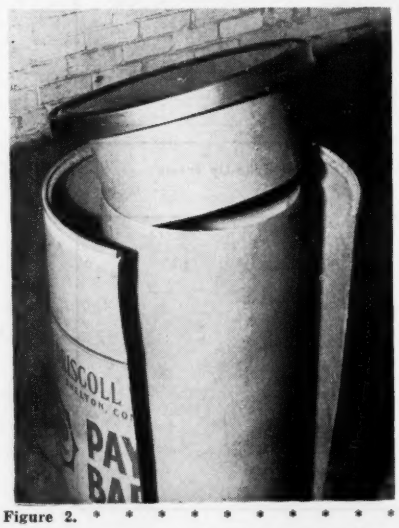

Figure 2.

for this core and a metal disc, or slinger ring, as we call it, is fastened to the inner cover, permitting it to be raised or lowered while wire is being paid off. A cover and clamp ring complete the assembly. To fill a Payoffpak it is mounted on a revolving chuck, chain driven from the shaft of the final capstan

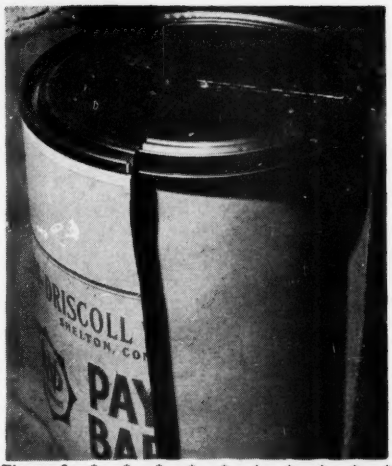

Figure 3.

floor of the drum. The wire which is cast to an 18 to 20″ diameter is not fastened to the drum. The free end, after emerging from the guide tube, falls to the bottom of the drum by its own weight. The action is that of a circular conveyer belt with certain important differences, the main one being that the wire descending to the bottom of the drum in an unstressed spiral has a tendency to wander, or hunt, as it reaches the bottom. This produces, automatically, a traversed pattern or "lay" which is, in effect, flat spooling, and which allows the wire to be removed from the drum at high speed without difficulty. However, the traverse lay has one serious fault which is that there is too much air in the mixture, and the drum weight is low. There are a number of ways to control the wander of the strand and promote greater concentricity and weight. While we do not believe that we have tried them all, we have experimented with a great many methods. A counter balanced vertical arm with spring fingers which combed the traversed strands and automatically raised as the drum filled, was one.

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A flexible tube with a runner at the bottom end which also rose as the wire filled the drum, and many others were tried. All of them worked but all required too much attention and we have now arrived at what we call a core extension, to which is attached fingers of round or flat stock which swing out freely because of the centrifugal force generated as the drum revolves. This provides a flexible cone on which the rings of wire form in a reasonably concentric pattern, and finally drop into the drum through

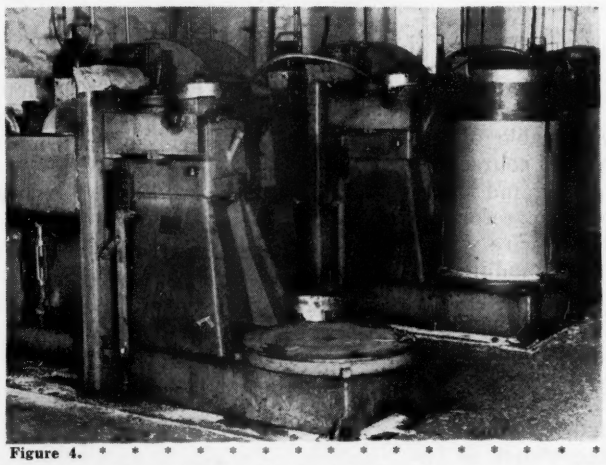

Figure 4.

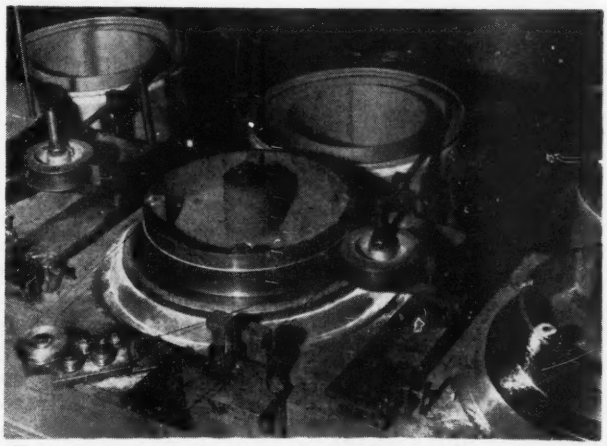

Figure 5.

which would ordinarily be the take-up block on a standard machine. This chuck is geared so that wire "poured" from the 16″ final capstan will be traveling at the same speed as an imaginary circle approximately 18″ in diameter on the

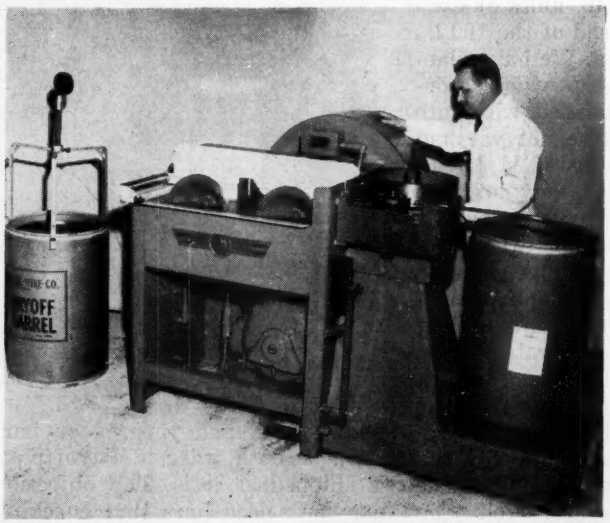

Figure 6. Specialty continuous fine wire drawing machine with automatic packaging feature.

Figure 7.

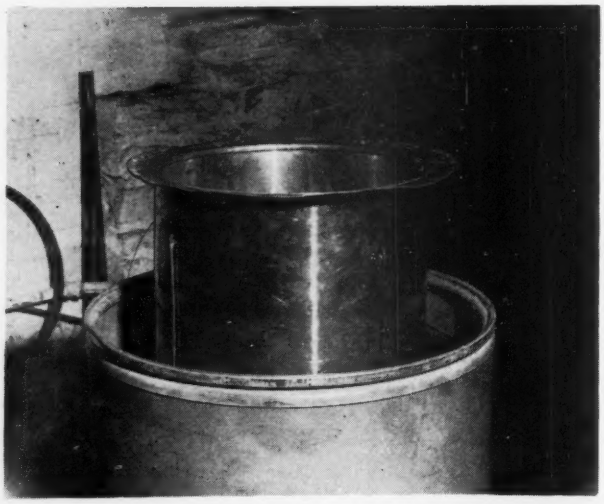

Figure 8.

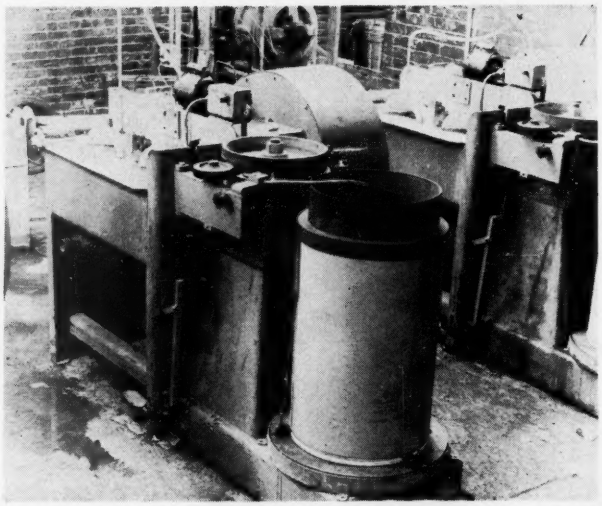

Figure 9.

compressing the cone by their accumulated weight, and slipping down the now parallel fingers. Depending on the size, temper, and cast of the wire a load in a standard drum of from 500 to 700 lbs. may be accumulated. We also use a so called hot-top which actually is an extension in height of the drum. This is used to permit loading the drum to the maximum. Since it is made of sheet steel it furnishes a convenient spot for hold down turnbuckles which are added as a safety factor.

★ ★ ★

This is an extremely sketchy description of the loading procedure, but there are so many variations possible with this relatively simple operation that it is probably best to outline only one method as an illustration of the system as a production tool.

★ ★ ★

There is no doubt in our minds, even at these early stages of development, that the Payoffpack method is a very considerable time saver in processing wire, as the drum can be used to feed wire processing machines and also to accumulate the finished product. The reduction in chore time, and the immediate increase in production are very noticeable, even when the Payoffpak is used only to feed the operation. On many operations this increase is not measured in small percentages but is really substantial, and, it must be said, tends to cause some difficulties with piece work standards.

★ ★ ★

Another very noticeable opportunity for savings is of course the virtual elimination of hand packing of coiled wire. I am referring now to those grades of wire which require rather careful handling. In many cases you will agree that the cost of slow hand operations such as packaging, paper wrapping, and burlapping is considerably higher than the extras charged for them. We have also found a number of unforeseen advantages such as being able to transfer from operation to operation without recoating due to the clean, dry, unbroken film of lubricant from the preceding step, or, in processes such as tinning, a very substantial increase in production due to our being able to place 500 lb. units at each tinning block instead of the 100 lb. coils formerly used. We have planned a tinning takeup which is designed to load finished wire into Payoffpaks but have not yet had an opportunity to install it. I realize that many of you may not have these particular problems but as an illustration of some of the problems solved by a change over to Payoffpacks there is the matter of multiple shifts. Prior to installing our new system the operator on the first shift virtually stopped work an hour before quitting because there was no profit for him to continue loading the unit for the benefit of the second shift. The second shift operator felt the same way.

Now, with a reservoir of wire which will run a full day without exertion, both shifts take off more product, do less work, make more money, and produce better quality wire without transfer to the packing room where coils would be dressed with a considerable scrap loss. While coils would be split,

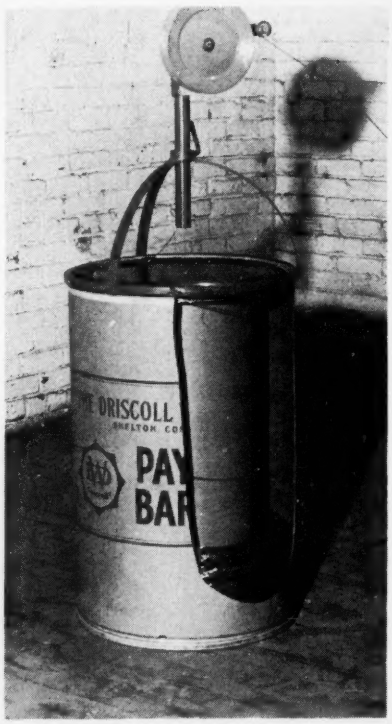

Figure 10.

tied, tagged and papered or barreled or both, wire in Payoffpaks is shipped as it is. The objection may be raised here that checking and inspection are impossible when

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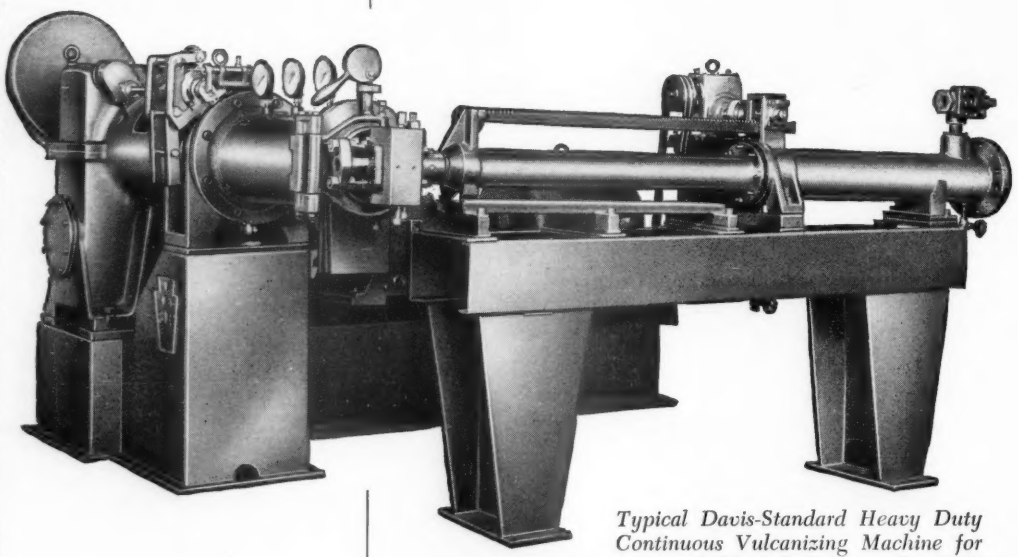

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the wire is in the drums. This is true, but we have found that the occasional stopping of a machine gives us the opportunity to inspect the wire while running. After all, wire on spools is also concealed. However, our fears on this point were unfounded and we believe that on the whole rejections and complaints are considerably less when wire is furnished in Payoffpaks as opposed to coils. There are several good reasons for this.

★ ★ ★

In the first place there is the problem of rust, staining, and corrosion. With the Payoffpak method the wire is virtually untouched by the operator, which in warm humid

Figure 11.

weather has always been a considerable source of trouble. After loading, the drums are covered and sealed. From this point they are easily handled with light hand trucks or are palletized and safety stored for subsequent operations.

★ ★ ★

The next step is to consider the Payoffpak as an economical and efficient shipping container. The Leverpak drum as a package for coils I believe is familiar to all of you but its function when transformed into a Payoffpak is somewhat different. Instead of being in individually tied coils, the wire is in one continuous length with no bands or ties to control the motion of wire within the drums. The inner disc or distributing hat does prevent vertical motion and of course when completely full the locking band and the cover are very efficient. A great deal of thought was given to the question of how it would ship, but fortunately like several of the other questions the actual results, after shipment of over a thousand tons, have

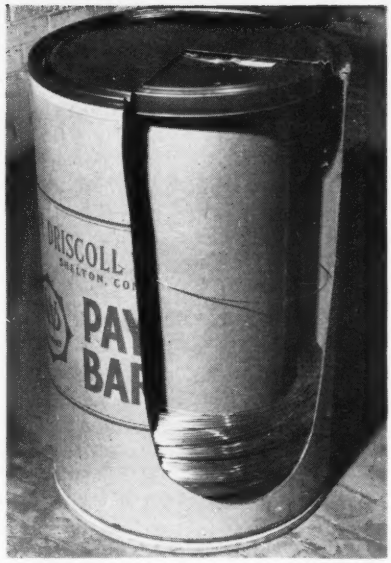


Figure 12.

been very satisfactory.

★ ★ ★

We have stenciled our drums "Do Not Roll" and certainly do not recommend it. Yet we have

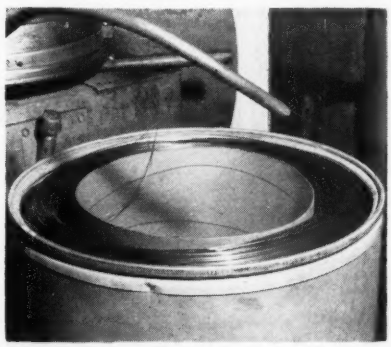


Figure 13.

known of several cases where this has been done without damage. In fact our losses because of damage in transit have been so far virtually nil. One reason for this, we believe, is that the arrangement of the unstressed wire and I am using the word "unstressed" again, provides a very effective shock absorber which may account in part for the very good results we have had thus far. The most drastic test of shippability was an accident. A trial shipment of three Payoff Barrels fell out of a truck, rolled some distance down the highway, and over a bank. The truckman recovered and delivered them. To everyone's surprise all three paid off without trouble. No one recommends this sort of thing with any form of container that I know of.

★ ★ ★

All of the foregoing may be true, worthwhile and economical but we now come to the most important function of the Payoff Barrel which is its advantage to the ultimate user of the wire or the customer. It is quite true that there

Figure 14.

are some wire users who cannot or will not use the Payoff Barrel for good and logical reasons but they are far outnumbered by those who not only accept the principle but insist upon the wire they use being processed and shipped by this method.

★ ★ ★

It has been very interesting to watch the changes in attitude among wire users after trying this system in their plants. There is a healthy degree of skepticism in our part of the country and certainly we do not claim that the Payoff Barrel is the answer to all wire problems, nor is it completely free from faults. But the fact remains

(Please turn to page 1482)

Die Making by the Electrical Discharge Machining Process

by H. V. Harding
Technical Assistant to the President
Elox Corporation of Michigan
Clawson, Michigan

A paper presented before the Annual Convention of The Wire Association in Detroit on November 10, 1954.

Wire-drawing, cold heading and extrusion dies can now be economically formed in carbide by the Electrical Discharge Machining Process. Although the Process is being put to use throughout the industry on innumerable applications in the difficult-to-machine metals, such as carbides, hard steel, titanium, molybdenum, etc; only recently has any real effort been made to form wire drawing dies. A preliminary look gives great promise for large savings in processing those dies used largely by the wire manufacturer.

★ ★ ★

Some understanding of how metal is removed to close tolerances and fine finishes by electrical discharge machining is necessary before this new concept can be applied to the actual forming of production dies.

1. **Metal is removed by electronic bombarrment of the work, generally termed electrical discharge machining.**
2. **There are three essentials which are basic in the process.**
   a) **an automatic feeding mechanism which permits a shaped tool to approach the work but never touch it.**
   b) **electrical discharge of high periodicity which are accurately controlled as to length, duration and energy value.**
   c) **a dielectric coolant which at all times immerses the work, cools it and carries away the "cuttings" or the end products of metal-removal.**

★ ★ ★

Many of the operations which are now standard are followed, except for the actual cutting of the metal.

★ ★ ★

Where small round draw-dies up to 1/2 inch in diameter are presintered to a few thousandths diameter, the present method of lapping with high-speed multiple lapping machines are quite competitive because of the simplicity of lap construction and ease of operation in a gang set up.

★ ★ ★

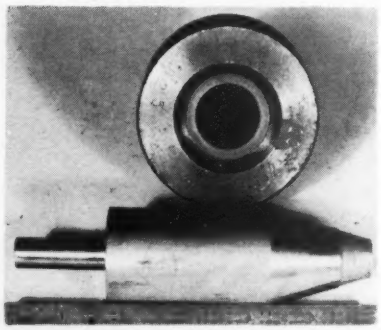
On dies which require diamond wheel grinding or laborious hand-working because of intricate design, there is a distinct advantage in the application of electrical discharge machining.

★ ★ ★

The same machine tools which are now used to make shaped laps can be employed to shape the tools or electrodes which reproduce their shape in the work piece. At this point, the two methods of machining a die become widely divergent. A comparison of these methods is given below:

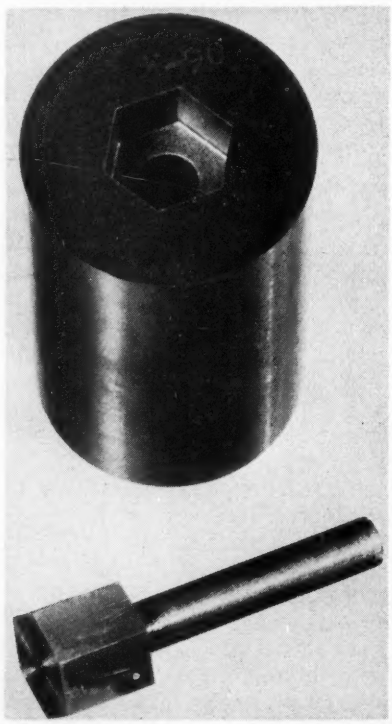
Note: The figures under "Me-

(*Please turn to page* 1487)



A large carbide draw die, showing the electrode used to open the approach up .042 inches in one operation. This was done on an Elox M-500 model machine and required 23 minutes. The tool or electrode, is turned from yellow brass. No diamonds or abrasives were used and the electrode did not revolve. Finish on this cut 8-10 micro-inch. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

A ½ inch hexagonal carbide draw die opened up to 17/32 inch by electrical discharge machining. Two electrodes were used, one to enlarge the die bearing and a shaped electrode to open the approach and blend in with the bearing. Total time—approx. one hour. Finish—8-10 micro-inch. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★



A cold heading die made in carbide and the brass tool or electrode used to sink the hexagonal shape. The tool was dressed twice to produce a flat bottom and good corners. Total cutting time 40 minutes. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Study of the Solvent Resistance of Formvar Enamels

by J. A. Loritsch, Manager
Alkyd Products Engineering
Chemical Materials Division
General Electric Company
Schenectady, New York

Dr. Loritsch presented this paper at the Annual Convention of The Wire Association in Detroit, Michigan, on November 9, 1954.

This paper represents a progress report, clarifying **some** of the factors which influence the solvent-resistant properties of Formvar wire enamels. We trust that some of the observations we have made will be new, and of interest, to you. Though our initial interest centered on the standard alcohol-toluol solvent resistance test, the preliminary data led us into an investigation which ranged from a study of the various components of Formvar wire enamels to a critical evaluation of the test method itself.

★ ★ ★

When Formvar wire is exposed to alcohol-toluene solvent in a Soxhlet extractor varying percentages of the enamel are dissolved. An infrared inspection of the dissolved material proved the presence of formvar resin, phenolic resin, and some solvent component. Beginning with this qualitative observation then, a study was initiated to determine the relative influence of the various enamel components on the alcohol-toluol resistance of formvar magnet wire. Four components, cresylic acids, formvar, phenolic resin, and hi-flash naphtha, were then scanned using a methanol extraction test as the analytical tool.

★ ★ ★

Please bear in mind in this work that we deliberately chose conditions which provide high extractables so as to obtain very positive increments of difference in measuring the effect of a large number of variables.

★ ★ ★

Figure No. 1 shows a comparison of data obtained in studying

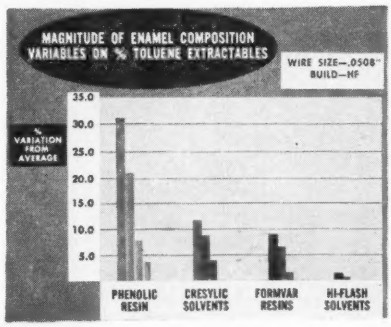


Figure 1. * * * * * * * * * *

these four variables in a typical enamel:

★ ★ ★

Inspection of the data indicates that extreme care must be exercised in using an extraction test as an analytical tool, and that the phenolic resin exerts a greater influence on % extractables than does **any** of the other three components.

★ ★ ★

An examination of the extraction test method revealed a number of critical variables. Unless otherwise stated, the following were held constant in this phase of the study:

1) Lot of formvar enamel
2) Build (HF)
3) Time/cycle (7 min.)
4) Number of cycles (20)
5) Wire speed) GE
6) Tower temp. curve) 2 section tower
7) Size of sample
8) Wire size

★ ★ ★

Figure No. 2 shows that 20 cycles are required to dissolve all of the extractable material.

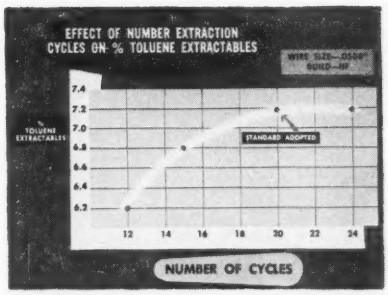


Figure 2. * * * * * * * * * *

The time duration of each cycle was not as critical as the **number** of cycles. For example, when 7′ cycles were increased to 15′ cycles the % extractables increased less than 3%, whereas doubling the number of cycles from 12 to 24 gave an increase of 15% in extractables.

★ ★ ★

Raising or lowering the tower temperature exerts a noticeable effect on % extractables as one could readily predict. This is shown graphically in Figure No. 3.

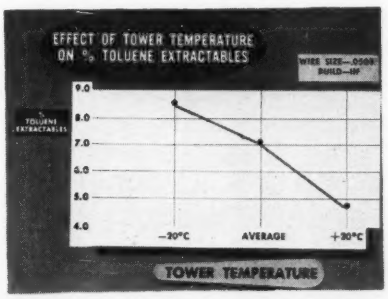


Figure 3. * * * * * * * * * *

A similar and related effect is shown by a change in wire speed. (Figure No. 4)

★ ★ ★

The addition of water to the extracting solvent also exerts a noticeable effect on time to failure in the standard 50/50 Ethanol/toluol

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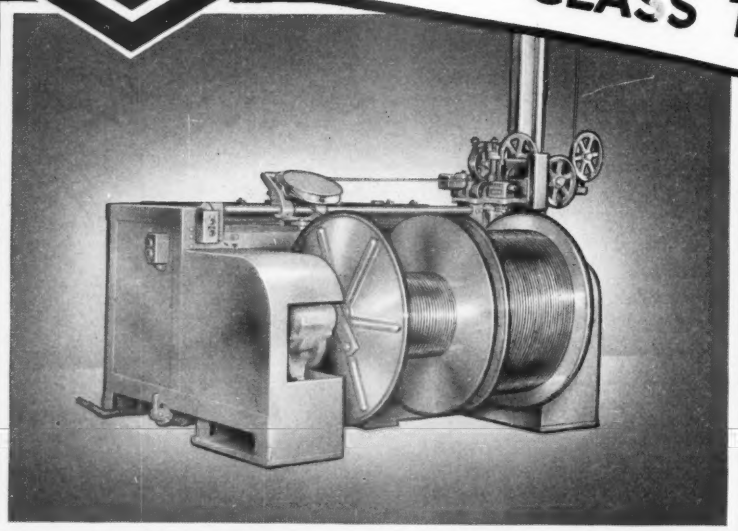

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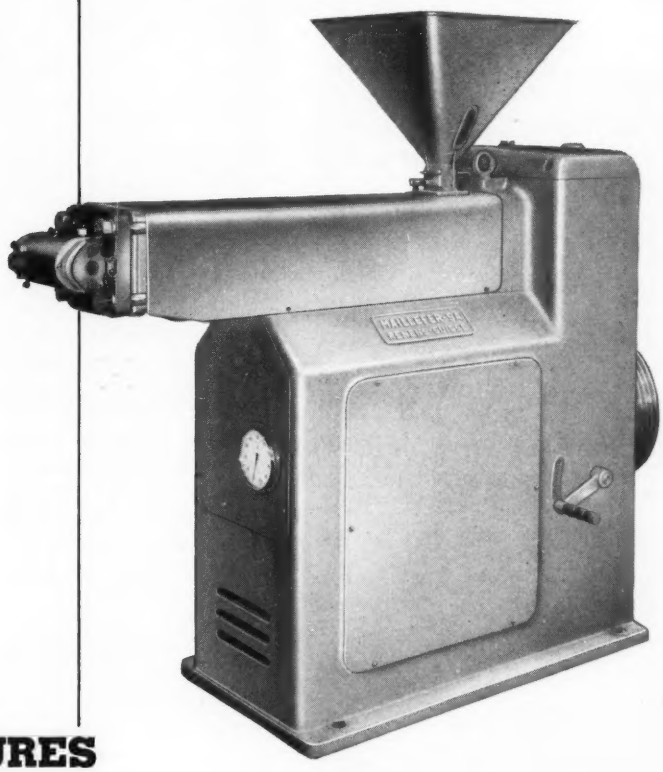

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Drive has forced lubrication system, built-in overload clutch, with ball and thrust bearings used throughout.

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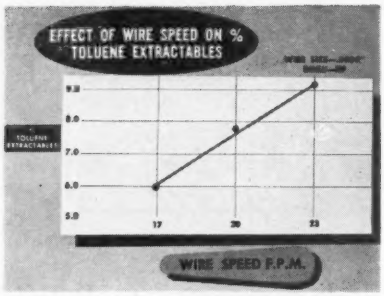


Figure 4.

solvent resistance test, as shown on Figure No. 5.

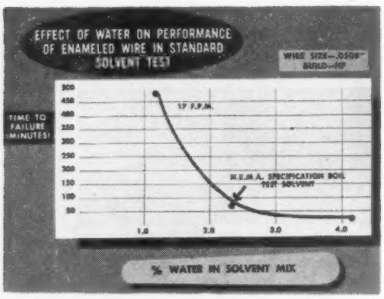


Figure 5.

One factor which surprised us in its magnitude was the effect of wire aging on % extractables as demonstrated in Figure No. 6.

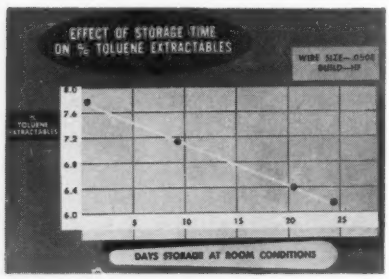


Figure 6.

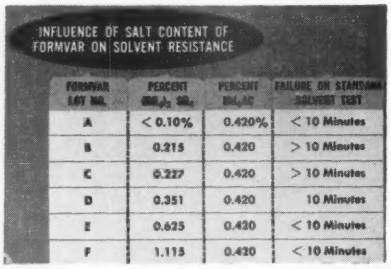
This factor is working fortunately in our favor. The effect undoubtedly would decrease with lower initial extractable percent.

★ ★ ★

An analysis of the foregoing data indicates that a number of factors must be carefully controlled if one intends to use an extraction test as either an analytical or control tool for wire evaluation.

★ ★ ★

While the above work was in progress, we spent further time investigating a variety of Formvar resins. Within the specification limits of "E" Formvar, with respect to % acetate, % hydroxyl, viscosity or washing and drying processes, we found no major variance in solvent resistance. We did find, in a qualitative observation, that salt content exerted an influence on solvent resistance as demonstrated in Figure No. 7.



FORMVAR LOT NO.	PERCENT	PERCENT	FAILURE ON STANDARD SOLVENT TEST
A	< 0.10%	0.420%	< 10 Minutes
B	0.215	0.420	> 10 Minutes
C	0.227	0.420	> 10 Minutes
D	0.351	0.420	10 Minutes
E	0.625	0.420	< 10 Minutes
F	1.115	0.420	< 10 Minutes

Figure 7.

Thus it appears that beyond critical limits the salt content can be a factor in solvent resistance.

★ ★ ★

Speculating from this initial lead we examined a variety of "catalytic additives", some of which possessed a marked tendency to increase the solvent resistance of standard formvar enamels. Seeking an explanation for this phenomenon a number of additives containing nitrogen, sulfate anions and potential formaldehyde donors were examined. A great many additives such as the ethanolamine phosphates, dimethyl glyoxime, aniline sulfates, etc., were found to be insoluble in the enamel system and thus were eliminated. Among the soluble salts, hexa methylene tetramine proved to be the best, with other amine-aldehyde condensates running close behind. In Figure No. 8, we have a list of additives which will improve the solvent resistance and a list of soluble additives which exert no influence (in concentrations below 1.2% based on formvar resin).

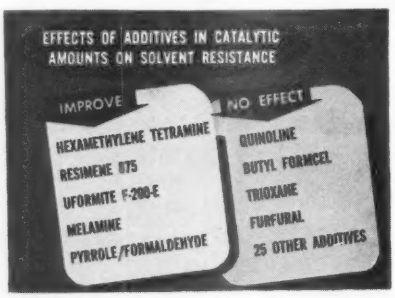


Figure 8.

The first two additives were by far the best and gave consistently reproducible results. The test employed, involved immersion of the wires in a boiling mixture of 50 parts of ethyl alcohol and 50 parts of toluene for a total time of 10 minutes. It was found that at concentrations of 0.1-5.0% based on formvar, excellent results were obtained. However, a preferred range was narrowed to 0.3-1.2%. These facts were distilled from a large number of observations.

★ ★ ★

Why should only a few materials from the great variety tried exert a noticeable improvement in solvent resistance? An examination of them shows that they all contain nitrogen, and that they can either accept or donate formaldehyde. Does the latter observation imply that the answer to this problem is intimately associated with the phenolic resin portion of the enamel? A thorough understanding of the phenolic resin structure may possibly enlighten our understanding of the solvent problem. This work is currently under way, and though we are not able to present a final, complete picture of the problem, we have evidence to indicate that the phenolic resin **is** a major factor in the solvent problem. In Figure 9, we have listed some variables within the phenolic resin which exert a pronounced influence on the solvent resistance.

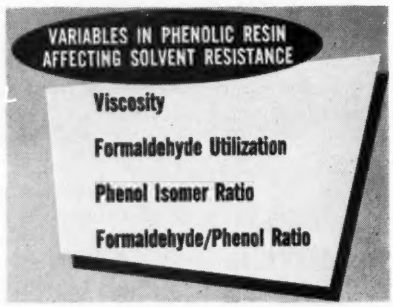


Figure 9.

Figure 10 shows the effect of HCHO utilization in the phenolic resin and its viscosity on % extractables.

★ ★ ★

In the course of this study we realized that unless tower temperatures and the conditions of application of enamel to wire were held

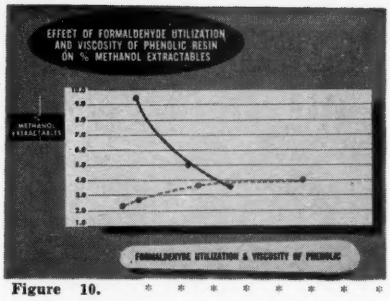

EFFECT OF FORMALDEHYDE UTILIZATION AND VISCOSITY OF PHENOLIC RESIN ON % METHANOL EXTRACTABLES
METHANOL EXTRACTABLES
FORMALDEHYDE UTILIZATION & VISCOSITY OF PHENOLIC

Figure 10.

rigidly constant it was extremely difficult to correlate a change in enamel composition, or resin component composition, with the solvent resistance of magnet wire. In searching for a tool to simplify this problem, we examined the possibility of preparing free films of formvar enamel which were independent of the copper substrate, and free of the vagaries of the wire tower.

★ ★ ★

To prepare the free films, strips of Teflon tape (2″ x 10″) are dipped in the enamel at the viscosity supplied, and allowed to drain at room temperature for one hour. If the films are not free of vapor bubbles, a slight reduction in enamel viscosity will eliminate this problem. The viscosity reduction is obtained by warming the enamel to 35-40°C. A little experience will allow an operator to master this technique.

★ ★ ★

The strips are then baked in a circulating oven at 185°C for one hour. To remove the resin film from the Teflon substrate, the Teflon is bent 180° crosswise, whereupon the resin film breaks free from the Teflon and can then be peeled away. It has been observed that Teflon strips which have been previously used work better than new strips in that the enamel solution wets the edges of used Teflon better.

★ ★ ★

The advantages of this technique are summarized as follows:

1) **Comparisons independent of substrate**
2) **Control of cure temperature**
3) **Control of cure time**
4) **Rapid screening**

★ ★ ★

We have determined for several of the variables indicated above that extractable data obtained with free films parallels the wire data as shown in Figure 11.

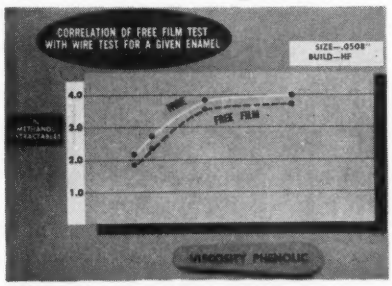


Figure 11.

★ ★ ★

The final phase of this work involves attempted correlation of Freon resistance with methanol resistance. For a given type of enamel a plot of % CH_3CH extractables vs % Freon extractables at various wire speeds shows a strong tendency for a straight line plot. However, we have not been able as yet to obtain acceptable mathematical relationship between these two factors for all enamels. Undoubtedly, we have here an area which could stand an intensive study and this will be necessary if we are to understand the design principles for a Freon resistant enamel. See Figure 12.

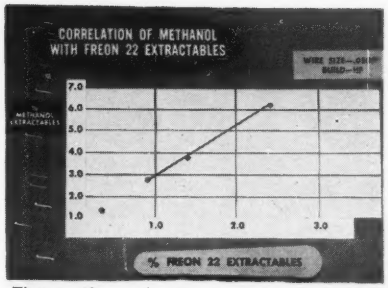


Figure 12.

Summarizing, our work has shown that:— (See Figure 13)

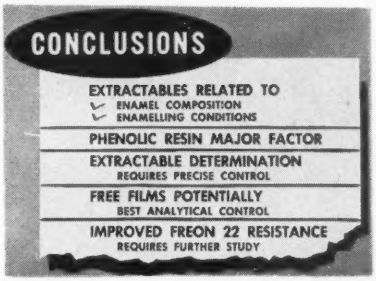


Figure 13.

1) **Extractables are related to enamel composition, and that the phenolic resin portion is a major factor.**

2) **Extractables are related to enameling conditions.**

3) **Analytical tools for extractable determination must be carefully defined.**

4) **Free films may become a better analytical control tool.**

5) **More study is required to improve Freon 22 resistant properties of formvar magnet wire.**

★ ★ ★

Grateful acknowledgment is due to Drs. Witzel, Walton, and Marshall and Messrs. Daszewski and Grossman of our laboratories for the data presented.

TO OUR GUESTS AT THE SILVER ANNIVERSARY CONVENTION IN DETROIT

It was a pleasure to have had you as our guests. We hope you enjoyed the technical sessions, the plant inspection tours and the many social gatherings. We hope you will want to become a member of The Wire Association and we extend to you a cordial invitation to join with us as a member to promote the welfare of our industry—which is your industry. We are here to serve you.

Please send for a booklet and a membership application card.

RICHARD E. BROWN, *Executive Secretary*

THE WIRE ASSOCIATION • 453 MAIN STREET • STAMFORD, CONNECTICUT

Phosphate Coatings in the Cold Drawing of Steel Wire

by James F. Leland, Mgr. Cold Forming Div.
Parker Rust Proof Company
Detroit, Michigan

A paper presented at the Annual Convention of The Wire Association on November 9, 1954, at Detroit, Michigan.

While phosphate coatings are being used almost exclusively by the wire drawing industry in England and Germany, they are being used on but a small percentage of the wire drawn in the U. S. Visiting foreign installations and comparing them with U. S. installations helps to reconcile this difference and suggests the possibility of wider application in this country.

★ ★ ★

The Germans and English, having once accepted the phosphate coatings as superior lubricant carriers and anti-welding agents, have proceeded to work out compatible lubrication and die design to permit their use. In the U. S., a great deal of "hit or miss" experimental work has been carried on with the result that little ground has been gained in the application of these coatings for high speed wire drawing. In addition, most of the experimental work underway on wire was set aside during the Korean Campaign when facilities and manpower were devoted to setting up and manufacturing steel cartridge cases and shell by cold forming methods.

★ ★ ★

The advantages and economies possible through the use of phosphate coatings began to be realized when in 1941 a major portion of the cold drawn tubing industry adopted the use of Bonderite.* At this time experimental work brought about gradual refinements in die design and compatible lubrication. Following World War II the people working on cold extrusion of steel proved to themselves, one by one, that production of steel parts by this method with the attendant extreme unit pressures was impractical on a large scale without the use of phosphate coatings.

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In the experimental work on wire, involving use of these coatings, improved performance had also been demonstrated in almost every case, despite the fact that die design and lubrication had not been particularly adapted to their use. It became evident, however, that the large unit area in relation to wire tonnage as compared with other applications made the cost picture less attractive and necessitated more economical and efficient methods of coating application.

★ ★ ★

The Parker Rust Proof Company has undertaken a long range research program on wire drawing devoted to answering some of the problems involved in the more efficient and economical application of coatings and to the development of even more compatible lubrication. Much of this work is accomplished in pilot installations in our laboratories but a final analysis must be done under production conditions and in production facilities. Over the past few years, we have had the privilege of working closely with John A. Roebling Sons of Trenton, New Jersey on carbon wire and with Allegheny Ludlum Corporation of Dunkirk, New York on stainless wire.

★ ★ ★

As a result of these efforts, the wet drawing of carbon wire and the dry drawing of stainless grades is in production on a large number of items. In each case, improved drawability and improved surface finish together with savings in manufacturing costs have been obtained. To date, however, most of the coatings have been applied in traditional cleaning house set-ups using available tanks even though these facilities, in many cases, are not sufficient to obtain optimum performance and costs.

★ ★ ★

While it is difficult to justify the capital expenditure involved in converting an old cleaning house, the installation of new facilities coupled with the advent of continuous patenting, cleaning and coating lines shows great promise for simplifying and improving the drawing of wire through use of phosphate coatings.

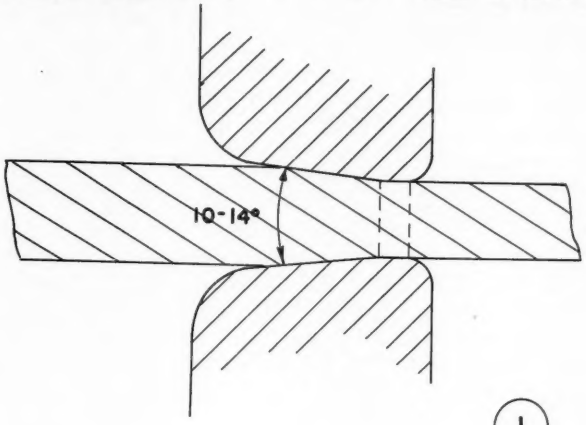
★ ★ ★

Briefly, the phosphate coating treatment consists of immersing the properly cleaned wire in a solution of zinc dihydrogen phosphate and phosphoric acid combined with accelerators—usually nitrates and/or chlorates. In a properly balanced bath, a very slight amount of the surface metal goes into solution and a crystalline non-metallic complex zinc phosphate coating is created on, and integral with, the metal. The coating thus produced serves as a lubricant carrier and although greatly elongated in the drawing process, must remain in sufficient quantity to serve as an anti-weld to prevent metal to metal contact between the die and the work surface.

★ ★ ★

The types of lubricants used in conjunction with these coatings as well as die shapes are of consider-

able importance. Experimental work has shown that from a lubrication standpoint, utilizing phosphate coatings, the best die shape for multiple pass drawing as illustrated in Figure 1, has an angle of approach from 5° to 7°, the included angle being 10° to 14°.

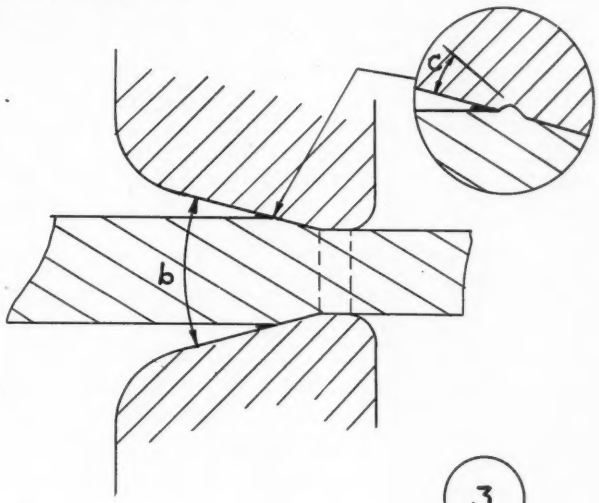


1

While this often requires a longer nib in the die, it has the advantage of drawing lubricant and coating through the die rather than scraping it from the work surface. Very often commercial dies are cut with a double angle to give a larger throat and allow greater reductions with a short nib die. As shown in Figure 2, such a die when placed in a multiple pass machine tends to defeat the purpose of the coatings and lubricants under discussion. The greater angle "a", at the point of contact, is generally sufficient to upset the wire causing fracture of the coating and removal of the lubricant to the detriment of the following dies in the set-up. Coating and lubricant thus removed tend to back up, further preventing the fresh soap in the die box from entering the die.

★ ★ ★

Another difficulty may arise from the method of reworking dies as practiced in many shops. A wide angle die or even one having the proper or desirable conformation originally, will eventually develop a wear ring which increases the effective angle at the initial point of contact as shown in Figure 3. The increase of angle "b" by the amount "c", due to wear, has the effect of scraping coating and lubricant from the workpiece and of preventing fresh soap from entering. In reworking such a die, the wear ring is frequently polished out by increasing the included angle as shown in Figure 4, again to the detriment of the coating and lubrication, thus effecting wear on following dies. In order to avoid such a condition and properly recondition worn dies, the approach should be re-cut to a definitely established angle all the way to the bearing and the bearing diameter re-cut to a larger size.

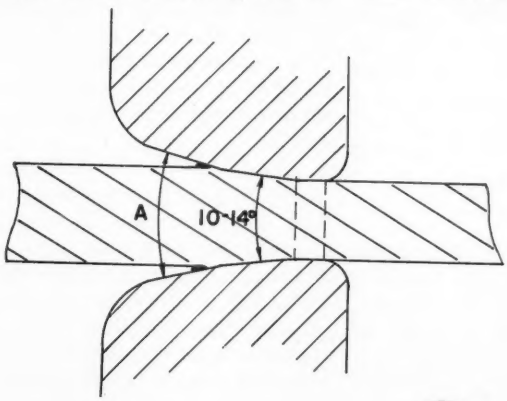


3

Bonderite for wire drawing shows to greatest advantage when used on wire of higher than 0.5% carbon content. The advantages obtained include increased die life and improved corrosion resistance of the finished wire.

★ ★ ★

In production practice improved die life does mean reductions in die and tool room costs. However, with the low cost of carbide dies, this is not the dominant factor in manufacturing savings t o d a y. With new high speed drawing equipment, the more important cost reduction comes from higher



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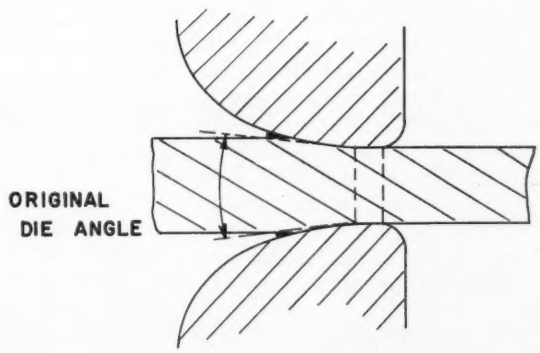


4

machine efficiencies resulting from fewer die changes and relatively uninterrupted runs. In a comparison with standard treatment practice, Dr. Keller of Metallgesellschaft, A.G., Germany, reported at the International Parker Conference in 1953 that through the use of phosphate coatings die life was increased on an average of 4 to 10 times. In a study of 7-pass dry drawing of 0.96 C wire with a 69% reduction in cross section the following results were reported from records kept over long production periods: (See Chart 1, Figure 5).

PROLONGATION OF LIFE TIME OF DRAWING TOOLS BY THE USE OF BONDERITE

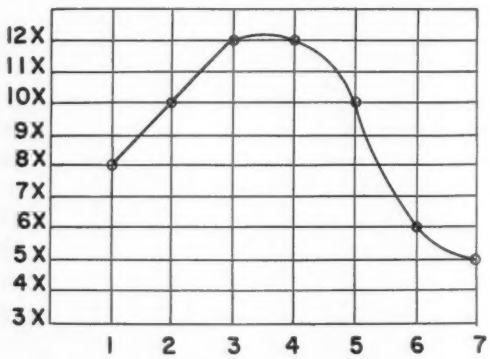


CHART I
FIGURE 5

As will be noted, the greatest improvement in die life was obtained in the third and fourth dies of the set-up whereas the fifth, sixth and seventh stage dies showed respectively shorter increases in life corresponding to the increased thinning of the Bonderite coating. The slightly higher wear rate on the first two dies can be attributed to the added work in burnishing the coating and in smoothing the rough wire. It is of importance to note that the increased die life or decreased wear is reported as being more uniform over all the dies in a set-up thus resulting in rounder wire and more easily re-worked dies.

Wet Drawing

John A. Roebling's Sons Corporation have employed phosphate coatings to advantage on wet drawing operations for some time. On 9 and 12 hole set-ups, rope wire is drawn at 2500 to 3500 feet per minute. Typical examples of draws made with an 0.47 starting size are as follows:

0.60 to 0.70 Carbon drawn to 0.012 or 0.0175 at 2500 feet per minute.
0.45 to 0.55 Carbon drawn to 0.006 or 0.0115 at 3000 feet per minute.

While these same drawing speeds were previously obtainable using straw coats (flash tin) applied in vats at the machine, results were not consistent enough to maintain optimum performance without excessive die wear and wire breakage in continuous operation.

★ ★ ★

The cost of applying the phosphate coatings was comparable to the cost of applying the straw coat. However, when the necessity for dumping the straw coat vats at regular intervals was taken into consideration, the chemical cost was one and one-half times to two times as great as their present phosphate chemical costs.

★ ★ ★

In processing the aforementioned wire this company presently spreads the coils on frames, cleans and treats in a series of immersion tanks as follows:

1. **Hydrochloric Acid Pickle**
2. **Water Rinse**
3. **Bonderite 160X (Phosphate coating material)**
4. **Water Rinse**
5. **Borax Rinse**

★ ★ ★

Briefly summarizing, the hydrochloric pickle removes the scale to produce a clean metal surface. The water rinse following removes residual acid and iron salts that would otherwise affect the balance of the phosphating bath and reduce its efficiency. The Bonderite 160X in turn, creates a fine textured crystalline coating which is to act as an anti-weld and as a lubricant carrier during the drawing operation. The succeeding overflowing water rinse removes most of the residual acid remaining from the coating operation and the final rinse containing 2 to 3 oz. of Borax per gallon of water serves as a dilute alkaline medium to neutralize any remaining traces of acid in the coating. This rinse also serves to prevent oxidation during drying and in storage prior to drawing.

★ ★ ★

In the drawing process, the wire is drawn through the first hole using a dry calcium stearate soap which is ironed into the coating and greatly improves lubrication in the following dies. The coolant pumped over the second and succeeding dies is a dilute solution of vegetable base soap, having a total fat content of from 0.4% to 0.6%. Several different soaps of this general type have been tried and used successfully.

★ ★ ★

The main advantages on such wet drawing have been: (1) better output per machine because of the ability to utilize the full speed of the equipment continuously with consistent results and (2) reduction in coating application costs.

★ ★ ★

To date, phosphate coatings have not been justified from a savings standpoint where present coating methods permit efficient dry drawing at the maximum speed of the equipment. However, with the introduction of continuous patenting, coating and cleaning lines this picture promises to change rapidly. In batch operation, chemical inefficiency due to drag out gave

the cost advantage to such coating materials as borax and lime. In strand processing, however, chemical consumption is reduced to a point where the controlled coatings produced by phosphate baths are more desirable and more readily accepted.

★ ★ ★

Several years ago, an experimental program was carried on in cooperation with one of the large wire mills which produced some interesting results. A continuous experimental run (24 hours a day for several weeks) was made, comparing drawing of Bonderite 160x batch treated wire on two machines with their regular borax coated wire drawn on two similar machines. The work was done on a 0.60 tire bead wire in a 7-die set-up and accurate records kept on total production, dies used, chemical costs and quality of the finished product. The advantages of speed, die life and quality were definitely in favor of the phosphate coating but the slight savings hardly justified the capital expenditure involved in revamping their cleaning house. Later pilot work by this same organization with continuous coating has shown that chemical consumption can be reduced 50% over batch method and therefore continuous coating presents an entirely different picture on the use of phosphate coatings for dry wire drawing.

★ ★ ★

The lime and borax coatings depend on substantial baking times to produce maximum drawability and present certain problems not easily solved in the space available and at the speeds involved with the new continuous patenting lines. Development work with the phosphate coating baths has resulted in baths which have produced coatings suitable for drawing in 20 to 30 seconds immersion time. Present work being done may well shorten processing time to 10 to 15 seconds. Under these conditions, the equipment required for application of the coatings would be substantially shorter in physical dimensions. Since the coating does not take on moisture, a simple dry-off would prepare the wire for coiling and storage. The coatings thus produced are chemically reacted with the surface, more uniform in nature than the dried on coatings and have no tendency to flake-off in handling which takes place prior to drawing. The coating solutions can be contained in mild steel equipment which if properly installed makes the solutions simple to control and to adjust to maintain uniformity of coatings.

★ ★ ★

Wire drawn with phosphate coatings tend to have a slightly darker appearance when coming out of a 7-pass machine than does conventionally treated wire. This residual coating is visual evidence of the separating layer which improves draw performance and which enhances the corrosion resistance of the finished drawn wire. When a high finish wire is required as a final product, this darker color usually excites comment and is interpreted as a rougher finish than the customary shiny one. In the case of wire, as has already been demonstrated on tubing, this low light reflectance is due to the extremely thin residual phosphate coating and is no indication of the surface roughness.

On some of the early work with tire bead wire, concern was expressed regarding this finish which it was feared would not meet the requirements of the final product calling for a high lustre copper finish. Since the lustre of the copper coating is dependent on surface smoothness of the wire, it was surprising when the darker appearing wire, drawn after treatment with Bonderite, produced the more lustrous copper coat.

★ ★ ★

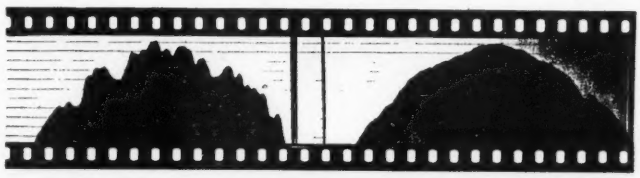
Profilograms taken around the circumference of the wire drawn after treatment with Bonderite and compared with those taken similarly on wire drawn after conventional lime coating, clearly demonstrate the superior finish of the former. Figure 6 shows the results of such measurements which are not magnified sectional views but rather the amplified swing of a light beam tracing the contour of the surface of a wire as it is rotated one revolution in a fixture. The improved drawn surface of the phosphate coated wire is of definite advantage in a number of applications.

Application to Stainless Wire Drawing

Coatings of a similar nature to those produced on Carbon wire have been created by Parker for drawing application in the stainless and alloys industry.

★ ★ ★

(*Please turn to page* 1479)



LIME TREATED

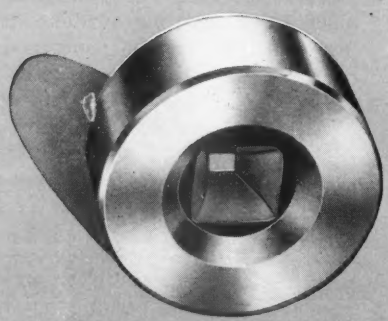
BONDERITE TREATED

PROFILOGRAM OF SURFACE FINISH AFTER DRAWING

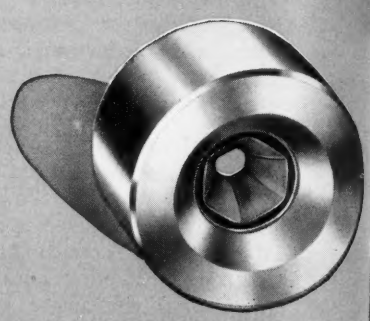
FIGURE 6

Why it pays to use C

Round-Hole Dies

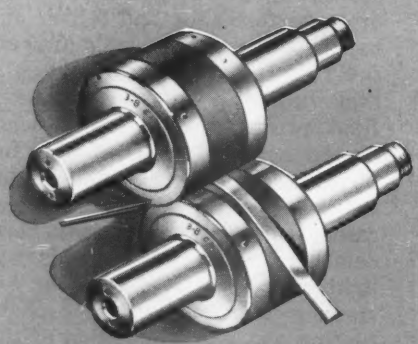


Square-Shape Dies

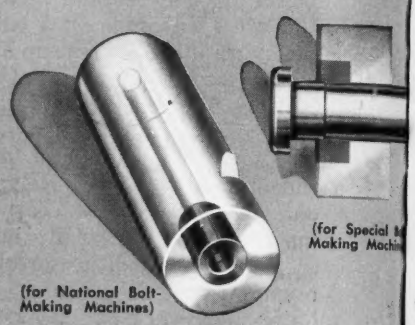


Hex-Shape Dies

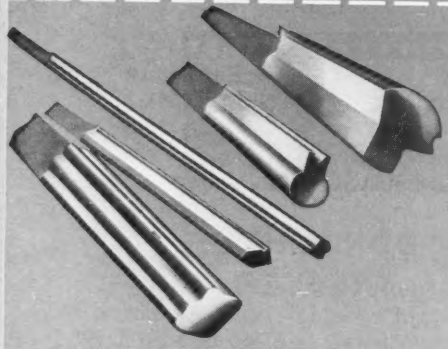
Capstan Rings



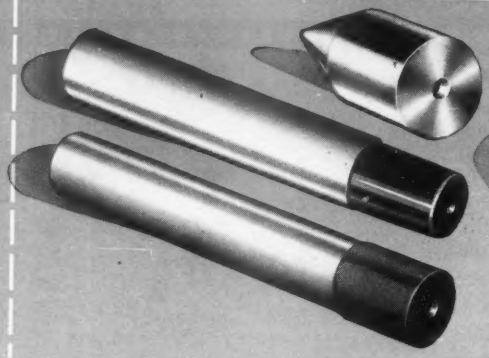
Wire-Flattening Rolls



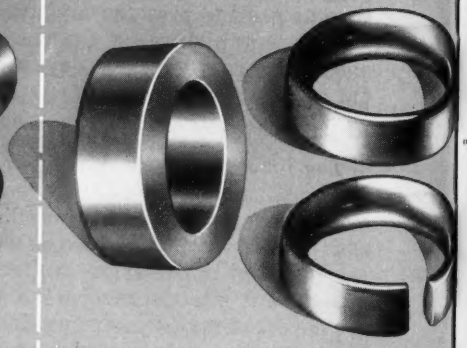
Extrusion Die Nibs



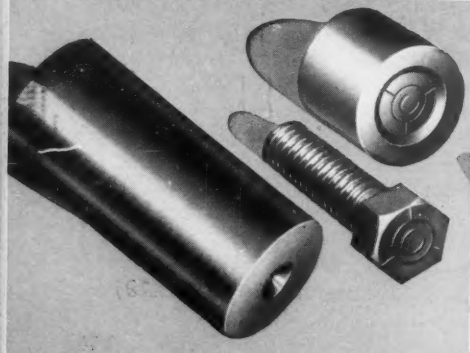
Special-Shape Dies



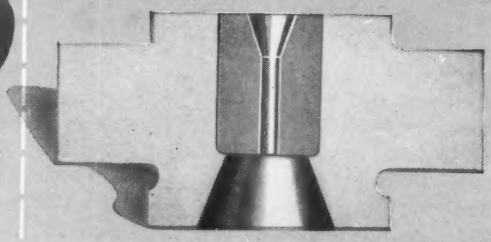
Mandrels and Mandrel Nibs



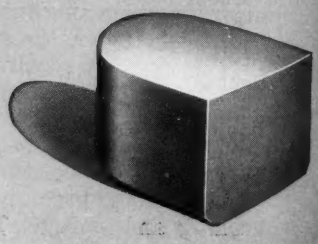
Bushings, Rings and Slotted Wire Guid



Header Die Nibs and Heading Hammers



Welding Rod Coating Dies



Nail Gripper Die Nibs

Carboloy® Wire Dies

1. Designed for maximum performance

You get maximum tonnage from every Carboloy wire-, bar- and tube-drawing die, because each die is designed right and built right, from the proven grade of Carboloy cemented carbide. Twenty-nine rigid quality control tests – stemming from a quarter century of Carboloy experience as the world's largest maker of cemented carbides–guarantee continuous precision production. Extra-long die life from high-quality Carboloy Cemented Tungsten Carbide adds up to extra tonnage for you.

2. Backed by experienced die specialists

Trained Carboloy Field Engineers will work with you to solve your trickiest, toughest die problems profitably and quickly. Working through Carboloy Die Service Centers, plants and laboratories, they have at their fingertips all the knowledge of the latest developments in the Carboloy Department program of continuous grade improvement. And, at the Carboloy tuition-free training school at Detroit, your key men will learn latest carbide application and maintenance techniques.

3. Serviced at nearby centers

You can switch costly die servicing and finishing downtime into profitable production time by calling upon your nearest Carboloy Die Service Center: Chicago 7, Ill., (phone–HArrison 7-4828); Detroit 32, Mich., (phone–JEfferson 6-9100); Pittsburgh 19, Pa., (phone–COurt 1-4880); Los Angeles, Calif., (phone KImball 7276).

4. Available from large local stocks

Complete stocks of standard dies – ready for immediate shipment – are maintained at Chicago, Detroit, Newark, Pittsburgh and Los Angeles. Large, readily available die stocks mean less downtime for your costly machines; die replacements as you need them . . . with lighter die inventories and tighter production schedules.

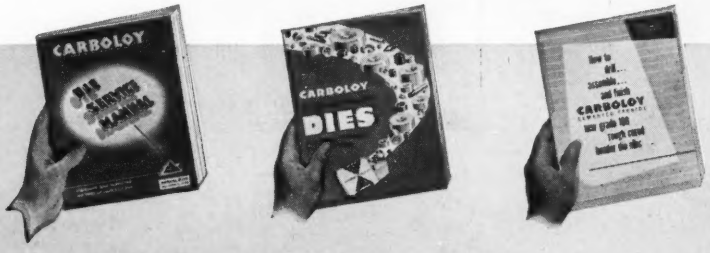
"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY STANDARD BOX

Famous, husky Carboloy standard box adds new convenience to storing and handling Carboloy wire dies. Protects your dies in transit and in toolrooms . . . saves inventory and ordering time.

FREE TECHNICAL LITERATURE

Write today for clear, comprehensive Carboloy Wire Die technical literature: Die Service Manual D-119; Die Catalog D-130; Header Die Manual D-131. Get the full story, too, on Carboloy engineering and technical services.



CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11171 E. 8 Mile Street, Detroit 32, Michigan

A New Copper Wire Rod Mill With Continuous Finishing

by Lucien Bournez, Project Engineer
Loewy Rolling Mill Division
Hydropress, Inc.
New York

An advanced type of wire rod mill for the production of copper magnet wire embodies several interesting innovations.

★ ★ ★

This mill, now being completed, will roll 5/16″ and 7/16″ copper wire from standard cast 250 lb. bars. A description of the main components and sequence of operation follows.

★ ★ ★

The mill, which includes a continuous finishing train (see schematic drawing), consists of:

A 24″ x 48″ 3-high Breakdown Mill with AC drive;

An 18″ x 52″ 3-high Intermediate Breakdown Mill with AC drive;

A 12″ x 28″ 2-high Intermediate Finishing Mill with DC drive;

Six 10″ x 24″ 2-high Finishing Stands arrange in pairs, each pair driven by a DC motor;

Three Wire Rod Coilers.

In this article the author has described a new continuous rod mill that his company is installing for a leading midwestern electric cable plant. This mill is the most important single item of equipment in the huge new plant being constructed for the manufacture of automotive wire and cable and which will be in operation early in 1955.

The 24″ Breakdown Mill

This mill, 3-high type with open-top housings, is equipped with 24″ x 48″ rolls mounted on roller bearings and is driven through a speed reducer, pinion stand, and universal spindles mounted on bronze slippers.

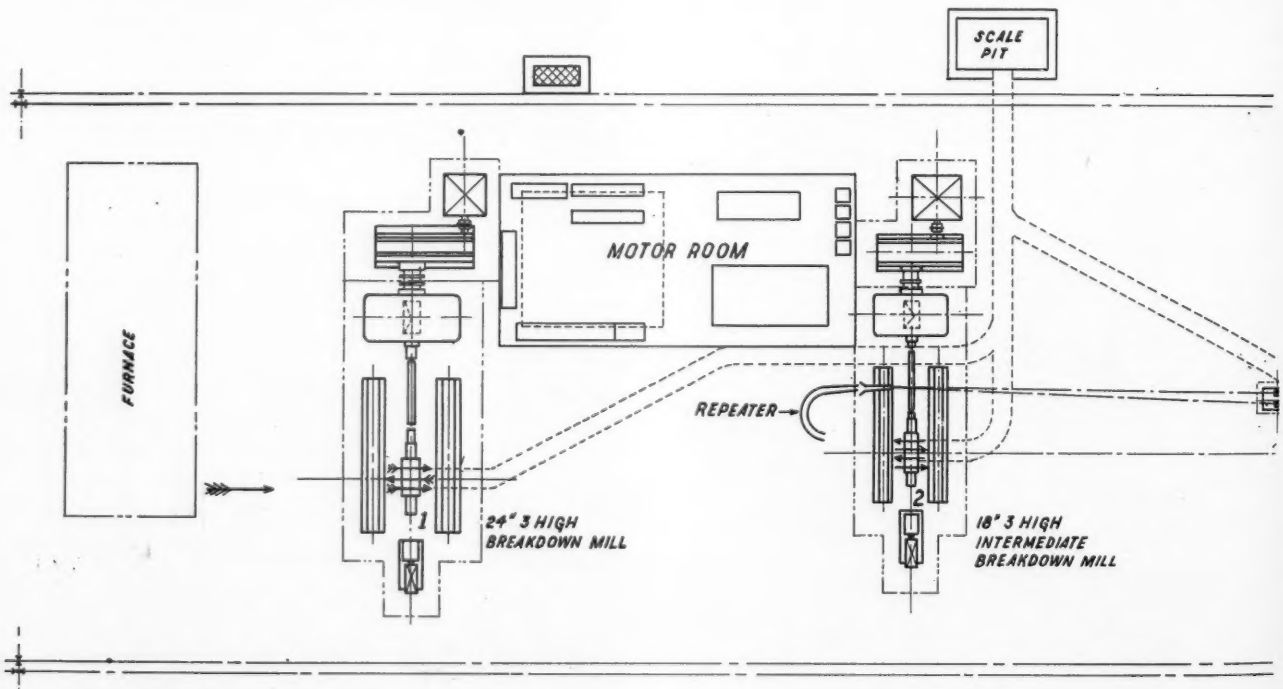
The comparatively large diameter of the rolls permits severe reductions without the need for ragging the passes. The rolls are adjusted by hand screwdowns operated by hand-wheels through worm gear drives.

★ ★ ★

A motor driven shifting system allows rapid pass changing and adjustment by sliding the entire mill on the shoe plates.

The 18″ Intermediate Breakdown Mill

This unit, of the 3-high type with open-top housings, is equipped with 18″ x 52″ rolls and is similar to the 24″ mill. It also has a



Copper Wire Rod Mill With Continuous Finishing. * * * * * *

motor driven shifting system.

The 12" Intermediate Finishing Mill

The first of the finishing mills is of the 2-high type with open-top housings, and is equipped with 12" x 28" rolls mounted on roller bearings. It is driven through a speed reducer-pinion stand combination with Gearflex type universal spindles.

★ ★ ★

Manual screwdown, for top roll adjustment, is operated by handwheel through two worm gear drives. Roller Guides on the entry side provide secure scratch free handling of the bars between passes.

The 10" Finishing Train

This unit consists of three pairs of two 10" 2-high stands. Each pair is driven through a dual takeoff reducer combination with two pinion stands.

★ ★ ★

The gear ratios of the reducers were selected to provide continuous rolling conditions within each pair of 10" stands. DC drive permits the necessary speed adjustment between each pair of mills.

The open-top type stands equipped with 10" x 24" rolls are mounted on roller bearings driven from the pinion stand by Gearflex type universal spindles. Roller Guides assure accurate positioning of the copper rod as it enters the rolls.

The Wire Rod Coilers

The three Garrett type coilers, which receive the copper wire in two strands, are mounted directly above the water tank and exit conveyor. Each coiler is driven by a DC motor.

★ ★ ★

Rod front tail ends control the coiling operation while air cylinders discharge the coils automatically.

★ ★ ★

The finished copper wire is rolled from the 250 lbs. bar in a maximum of 14 passes in the following manner.

★ ★ ★

A copper bar, upon leaving the re-heating furnace, is deposited on the mill approach table which conveys it to the 24" 3-high Breakdown Mill for Pass No. 1—entering the mill between the middle and top rolls.

Three passes are made in this mill. Between passes the bar is manipulated by chain-driven roller tables assisted by air-operated lifting and tilting arms which permit a 90° turning of the bar between passes.

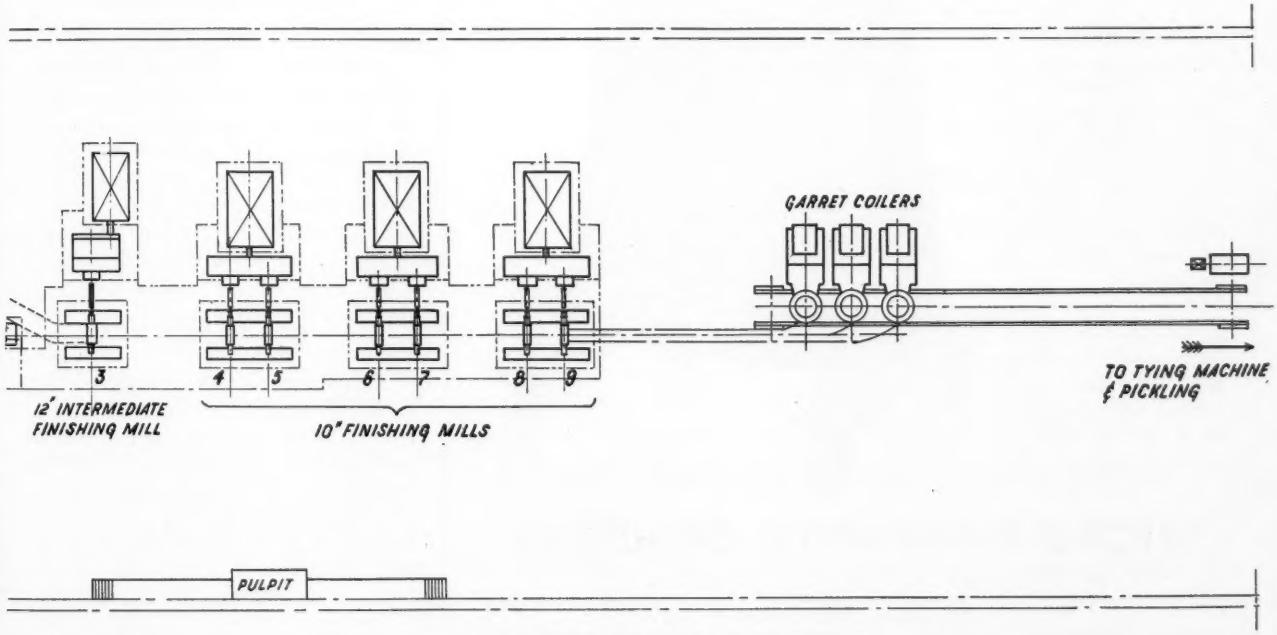
★ ★ ★

After pass No. 3 a roller table conveys the bar from the 24" mill to the 18" Intermediate Breakdown Mill. Here the bar enters the stand between the bottom and middle rolls and four passes are made.

★ ★ ★

After the seventh pass the bar leaves the 18" mill and enters an oval repeater connected to a trough which leads to the 12" intermediate finishing stand. An air-operated switch directs alternate bars into alternate passes. The repeater makes it possible for the rod to be in both the 18" mill and 12" mill at one time and yet overcomes a continuous condition. This "continuous condition" would ordinarily require DC drives on both the 18" and 12" mills, resulting in an extremely slow speed on the 18" mill or undesirably high coiling speeds.

(*Please turn to page* 1481)



Copper Wire Mill With Continuous Finishing (Cont'd)

Government Wire Production Information

Department of Commerce Makes Research Reports Available

Manufacturers and research laboratories are urged to make more use of the growing stockpile of research reports released by the Federal Government through the Office of Technical Services (OTS) of the **U. S. Department of Commerce,** Washington 25, D. C.

★ ★ ★

The Government is conducting or sponsoring scientific and technical research at a current rate of more than $2 billion a year, mostly for defense purposes. By far the largest share represents applied research and development. This research generates a vast amount of non-confidential technical information that is available to businessmen who are interested in developing new production processes, in making technological improvements, and in avoiding duplication of research efforts. Even ideas for new products have been sparked by these reports.

★ ★ ★

Some 350 such reports are described each month in **U. S. Government Research Reports** (formerly the "Bibliography of Technical Reports"), which is available from the U. S. Department of commerce or any of its field offices at $6 a year.

★ ★ ★

The research covers nearly every field of industrial activity, including chemicals, plastics, paints, electrical machinery and electronics, foods, fuel and lubricants, instrumentation, leather, lumber, metals, minerals, paper, ordnance, physics, rubber, textiles, aeronautics, transportation, water supply and other items.

★ ★ ★

The availability of this material is brought to the attention of our readers. Titles of reports, descriptions, prices and order blanks are included in each monthly issue of the publication.

Effort Made to Speed Machine Patents

Secretary of Commerce **Sinclair Weeks** has announced the appointment of an Advisory Committee on Application of Machines to Patent Office Operations. Its Chairman is **Dr. Vannevar Bush,** President of the Carnegie Institution of Washington, and Director of the Wartime Office of Scientific Research and Development.

★ ★ ★

Secretary Weeks said, "The establishment of this Committee of outstanding experts is aimed at finding new ways to speed up the processing of patent applications, thereby stimulating economic growth and employment that result from new inventions.

★ ★ ★

The Patent Office, under Com-

MODEL "J" TYPE AUTOMATIC MICRO-WELD BUTT WELDER

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

This type welder is available in four Models (J-45-C) (J-5-C) (J-7-C)(J-8-C) for welding COPPER, ALUMINUM, and other non-ferrous wire and rods, ranging in size from .080" to ½" diameter.

The welding cycle on these units is automatically completed by one single downward stroke of the foot pedal, which clamps the stock being welded, contacts the welding switch, and supplies the upset pressure on the weld.

All welders are equipped with annealing dies, filing vise, hand shears, and mounted on a 4-wheel truck.

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Telephone, State 2-7468

missioner **Robert C. Watson,** has made much progress in introducing new efficiencies in the examination of patent and trademark applications. But with the volume and complexity of modern technical developments steadily increasing, there is need for acceleration in patent searching.

★ ★ ★

Each individual patent application requires reference to innumerable patents to determine whether the idea is brand new. As the field of invention is constantly being enlarged, the field of individual processing likewise must be expanded.

★ ★ ★

If high speed electronic devices can be used to replace time-consuming manual sorting and searching of reference material, the result could be a tremendous boon to inventive progress.

★ ★ ★

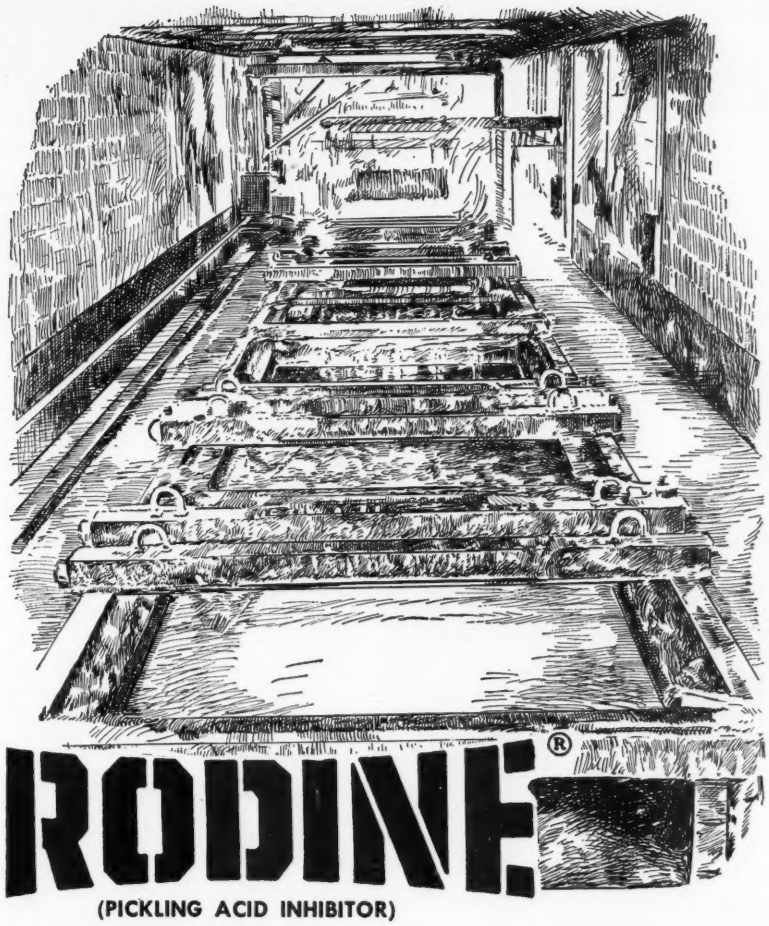
The Committee will study this special problem of the Patent Office, and suggest possible ways in which new mechanical and electronic devices might be profitably adapted to improve service.

★ ★ ★

Dr. Bush said that he does not minimize the difficulties of devising machine techniques for sorting and searching relevant patents on such widely diversified inventions as electronic circuits, complex mechanical devices and chemical compositions.

★ ★ ★

He pointed out, however, the present-day, large-scale bank and insurance operations could not be carried on without the new mechanical and electronic devices that have now been adapted to these purposes. Computers are being successfully used in the solution of the extremely complex problems involved in the control and guidance of guided missiles. Scientific problems that were once considered impossible of solution because of the enormous time required for the computing work, are now organized by men and left to machines, which work out in a short time those details that might have taken lifetimes of manual work in the past.



RODINE®

(PICKLING ACID INHIBITOR)

STANDARD
PICKLING PRACTICE
THE WORLD AROUND

Rod and wire are pickled clean with "Rodine" without wasting either acid or metal. Breakage in drawing from acid brittleness is minimized.

It is cheaper to pickle with "RODINE" than without "RODINE"

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

CHEMICALS ACP PROCESSES

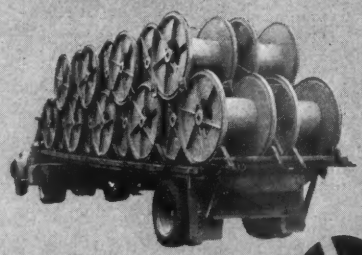
General Offices: Ambler Penna.

CHEMICALS ACP PROCESSES

Detroit, Michigan *Niles, California* *Windsor, Ontario*

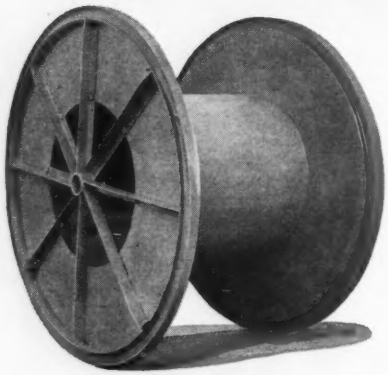
There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



I'm a NYECO customer

NYECO Steel Shipping Reels



YOUR BEST BUY!

because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

ANY QUANTITY | ANY SIZE | ANY LOAD | FLANGE DIAMETER FROM 36" UP

SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

For prompt, reliable, down-to-earth data and quotations

WRITE, PHONE, WIRE

NYECO

Specialists to the Wire Industries for Over 45 Years

NEW YORK ENGINEERING COMPANY

75 West Street, New York 6, N. Y.

TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

These leading mills prefer NYECO Steel Reels: OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE

Dr. Bush stated that he had long felt that our patent system should be a more dynamic and vital part of our industrial and economic system. He expressed the belief that the successful application of modern machine methods to the work of patent sorting and searching would not only shorten the time required but would make it possible for examiners to utilize their scientific and legal training to better advantage in coping with patent problems of a more stimulating nature.

★ ★ ★

The Committee will welcome suggestions from individuals and organizations active in the field. They may be addressed to the executive secretary of the Committee: Norman T. Ball, Room 2322, Department of Commerce, Washington 25, D. C.

Abstracts

INFLUENCE OF GAS ABSORPTION ON MECHANICAL STRENGTH OF METAL WIRE.
H. Forestier, A. Clauss. Comptes Rendus 1954 Vol 238 (2) pp 207-209 (Jan 11); Battelle Techn Rev—Abstr 1954 Vol 3 (6) p 389a (June) (Original in French).
Relation established between fracture during stretching of fine wire and nature of gas present.
Y* **C 11.0**

★ ★ ★

QUERSCHNITTSMESSUNG AN DUENNEN DRAEHTEN IM SPIEGEL DER PATENTLITERATUR. THE MEASUREMENT OF THE CROSS-SECTION OF THIN WIRES, AS SEEN IN PATENT LITERATURE.
E. A. Franke. Draht-Welt 1954 Vol 40 (16) pp 181-184 (Aug 25) (In German).
Reviews of old and recent German patents.
G **C 11.0**

★ ★ ★

DRAWING COPPER TUBES.
Marshall Richards Machine Co Ltd. Engineering 1954 Vol 178 (4616) p 81 (July 16).
In demonstration, length of copper tube of 1.35 in. outer dia and 0.058 in. wall thickness reduced to 0.375 in. outer dia with 0.036 in. wall in 6 passes. 2 illustr.
Y* **C 11.0**

★ ★ ★

NEUE MEHRFACH-DRAHTZIEHMASCHINEN MIT VERMINDERTEM UND KONTROLLIERTEM GLEITEN DES DRAHTES AUF DEN ZIEHSTUFEN. NEW MULTIPLE WIRE DRAW-

ING MACHINE WITH REDUCED AND CONTROLLED SLIDING OF THE WIRE IN THE DIFFERENT STEPS. W. Nacken. Draht 1954 Vol 5 (8) pp 288-289 (Aug) (In German).

Description of new multiple drawing machine of Maschinenfabrik Niehoff KG, Schwabach bei Nuremberg. Machine has up to 25 steps and cross-sectional area can be reduced continuously in successive steps. Considerable improvement on former machines claimed. 3 illustr, 1 ref.

G **C 11.0**

★ ★ ★

STEEL WIRE INDUSTRY IN INDIA. I. M. Pai. East Met Rev 1953 Vol 6 (1) pp 111-112; Bibl Sci Publ S Asia 1953 (9) p 119 (Jan-June).

X **C 11.0**

★ ★ ★

WIRE DRAWING DIE PROFILOSCOPE. Rudkin & Riley Ltd. Ind Diamond Rev 1954 Vol 14 (166) p 197 (Sep).

Firm appointed sole distributors for wire industry of wire drawing die profiloscope made by Longworth Sci Instr Co Ltd and designed by BISRA.

G **D 11.0**

★ ★ ★

Inquiries for information on the foregoing abstracts should be directed to Industrial Diamond Information Bureau, 32 Holborn Viaduct, London E.C. 1, through whose courtesy they are published.

New Steel Carbide Grade Developed by Firth Sterling

Firth Sterling Inc. has announced a new grade of sintered carbide, Firthite TXL, designed specifically for steel milling applications. It is a completely new combination of materials and processes developed in Firth Sterling research laboratories and pilot plants.

★ ★ ★

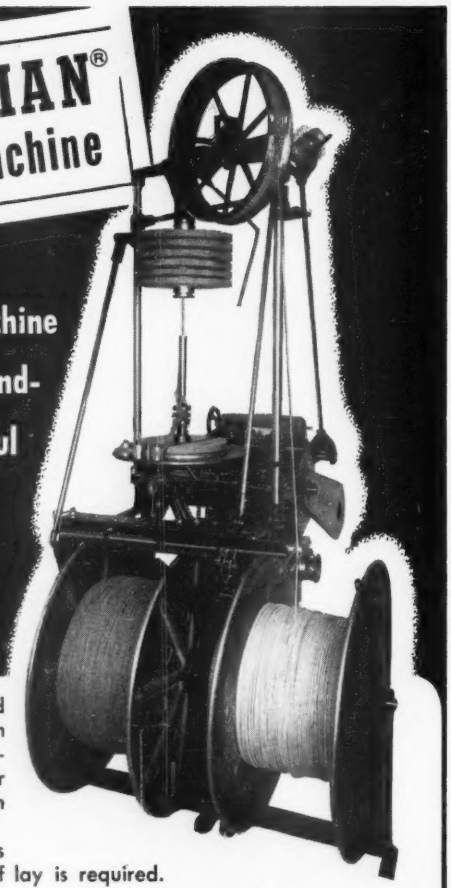
The product of a new concept in carbide metallurgy, Firthite TXL gives increased hardness along with increased strength, thus providing greater wear resistance combined with increased shock resistance in milling applications. With an approximate Rockwell A hardness of 92 and strengths comparable to the stronger steel cutting grades, it is a general purpose milling grade. Through tests both in Firth Sterling laboratories and in the field, Firthite TXL has increased the amount of metal re-

Manufacturers of Phillips head and other precision cold headed parts know a good thing when they *see the production records*!

In plants where Keystone "Special Processed" Wire is on the job, output per machine, per man, per hour has increased. Die life, for example, is often more than doubled — which in turn decreases machine down time and labor costs. A higher quality end product with its lower rejection rate helps place the per unit cost on a much more profitable level.

The superior grain flow characteristic of "Special Processed" Wire, together with its structural soundness, give this wire unsurpassed performance on any unusually difficult cold heading job. For further information, contact your Keystone representative or write direct.

WARDWELLIAN® Tape Serving Machine



A Special Wardwell Machine With a Long and Outstanding Record of Successful Performance!

Applies Narrow Width Tapes (up to 1" wide) To Electrical Conductors.

Has electric stop-motion and capstan-release mechanism which permits the conductor to be retracted and placed in position for re-run after supply has been replenished.
"Reeves" variable speed unit gives quick adjustment when change of lay is required.
Adjustable traverse mechanism lays material evenly on windup reel.

Other Features Include These:

- Machine will produce 58 feet per minute giving a maximum lay of 1". Minimum lay is 3/8".
- Serving head speed 700 R.P.M.
- Driving pulley 8" diameter; 1¾" belt. Speed 330 R.P.M.
- Ratio serving head speed to pulley speed 2.12 to 1.
- Capstan 18" diameter, 3" face.
- Opening through serving head 5/8" diameter.
- Maximum diameter of flexible conductor 3/8".
- Supply packages 12" diameter, 1" maximum width, 3/8" minimum width. Size of hole in package 3"
- Supply tube will hold 9 packages, 1" wide, sufficient for normal lengths of conductors.
- Maximum power requirement ⅓ H.P. including power transmission.
- Motor drive furnished upon request.
- Stands can be furnished to take reels as follows:
  30" diameter and up to 13" outside width
  30" diameter and up to 16" outside width
- Special wind-up driving parts required for reels with drums under 8" diameter.
- Reels are not included with machine.

NOTE: Serving Head normally runs clockwise, but can be made to run counter clockwise upon request.

Complete detailed information on "Wardwellian" Tape Serving Machine on request.

There are nearly thirty applications for Wardwell equipment, including Braiding, Shielding with wire, Tape Serving, Yarn Serving, Asbestos Serving, Paper Serving, Armor Serving and Resistance Wire Serving.

WARDWELL
BRAIDING MACHINE CO.
Central Falls, Rhode Island, U.S.A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

moved in mass production operations and materially reduced unit costs through uniform performance.

★ ★ ★

Firthite TXL is now available to industry. For technical information and test results, write for Firthite TXL literature.

13-Mile Canal Reinforced with Welded Wire Fabric

Houston's new water supply canal has been completed ahead of schedule through the use of massive, unique, "production line" machinery, designed in part by the contractor.

★ ★ ★

The 13 mile canal will carry 150 million gallons of water daily to augment the supply to this city of over 500,000 population. The canal was lined with concrete to allow the maximum flow of water and reinforced with welded wire fabric to control and minimize any cracks which might occur in the concrete. It is V-shaped, 6 feet deep and 32 feet wide.

★ ★ ★

The "backbone" of the canal lining, steel welded wire fabric, was unreeled from huge bobbins on a specially built machine that lowered the fabric into position on the previously trimmed and cleaned canal bed. It is the belief that this is the first time such a machine has ever been used. For continuity of reinforcement, the strips of fabric, of number twelve gauge galvanized wires with four by four inch spacing, were overlapped and tied together by workmen who followed the machine.

Rumors of Copper Shortage Said to be False

Scare stories about the shortage of copper that have led some industrial users to search for substitutes are completely unfounded, an industry leader said recently. The metal is in ample supply and copper production during the next year or two will be increasing by nearly one fourth.

★ ★ ★

George W. Proffitt, Executive

Secretary of the **Copper and Brass Warehouse Association,** told a meeting of construction industry officials recently that during the last emergency, the propaganda regarding the shortage of copper was—as is usual—greatly exaggerated.

★ ★ ★

"About every ten years somebody comes up with the prediction that the world copper reserves will be exhausted in 25 years," Mr. Proffitt said. "Before anybody has time to get excited about this pronouncement the press carries news of the opening of vast new copper fields in Southern Rhodesia or somewhere and states the field covers thousands of square miles and the ore is the richest yet found. So, the oldest metal in use by man gets written off about every ten years only to come back in greater supply than ever before.

★ ★ ★

"During the most recent 'so called' copper shortage many substitutes both metal and plastic came into use in many industries, including the construction industry."

★ ★ ★

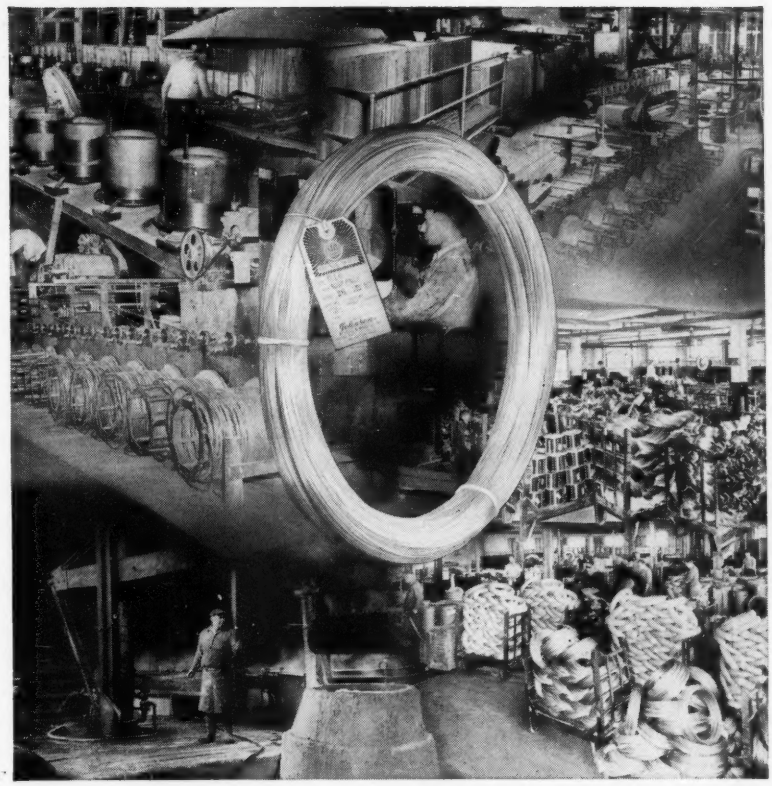
Mr. Proffitt concluded his remarks by pointing out that construction people can depend upon copper and copper base alloys continuing on an immediate shipment basis.

Handbook on Aluminum Rod, Bar and Wire

An excellent handbook entitled "Aluminum Rod, Bar and Wire Product Information", has been issued by **Kaiser Aluminum & Chemical Sales, Inc.,** 919 N. Michigan Ave., Chicago, Ill., in which is given very complete information on how these products are made, the different qualities and grades of aluminum, alloys, fabricating methods, forming techniques, joining and finishing. The book contains complete engineering data and tables.

★ ★ ★

Users of aluminum may send for copies on company letterheads.



The worst thing about doing nothing is that you can't stop and rest.

Here at JOHNSON for nearly three decades we have had little time to do nothing. Intense wire activity you can see anytime you visit our plant in the Quinsigamond section of Worcester—the cradle of commercial wire drawing—a section of the great wire producing city of Worcester, where there live many men whose families have drawn wire for three generations.

JOHNSON STEEL AND WIRE COMPANY, INC.

WORCESTER 1, MASS.

New York Philadelphia Pittsburgh Cleveland Detroit Akron
Dayton Chicago Atlanta Houston Tulsa Los Angeles

A SUBSIDIARY OF PITTSBURGH STEEL COMPANY

Outstanding Personalities of the Wire Industry

Appointed Spring Field Engineers by Hunter

J. Ray McDowell and **W. F. W. Reeve** have been appointed as field engineers by **G. D. Bennett,** Sales Manager of the **Hunter Spring Company,** Lansdale, Pa. Mr. McDowell, a graduate of M.I.T. and formerly with Worthington Corporation, will be responsible for New York State. Mr. Reeve, who was graduated from the University of Pennsylvania and has been with J. Bishop & Co., will provide engineering services in Ohio and Kentucky. These appointments are the latest in Hunter's program to expand its field engineering staff to maintain close liaison with users of springs, stampings, wire forms, and the company's new special spring products.

Crucible Steel Adds Staff Metallurgist

Crucible Steel Company of America has appointed **Edward A. Loria** a staff metallurgist assigned to its central metallurgical office, Pittsburgh, **D. I. Dilworth, Jr.,** director of metallurgy, announced recently.

★ ★ ★

Mr. Loria's principal efforts will be in the field of stainless and heat resisting materials.

★ ★ ★

Mr. Loria was formerly associated with the research and development department of the **Carborundum Company,** Niagara Falls, N. Y., as senior metallurgist. His previous experience includes service as senior fellow in metallurgy at the **Mellon Institute of Industrial Research** and as assistant metallurgist in the research and devolopment laboratory of **United States Steel Corporation.**

★ ★ ★

Mr. Loria was graduated from Carnegie Institute of Technology with Bachelor of Science and Master of Science degrees in Metallurgical Engineering. He has also completed graduate courses in metallurgical engineering and physical metallurgy at the University of Pittsburgh and Massachusetts Institute of Technology.

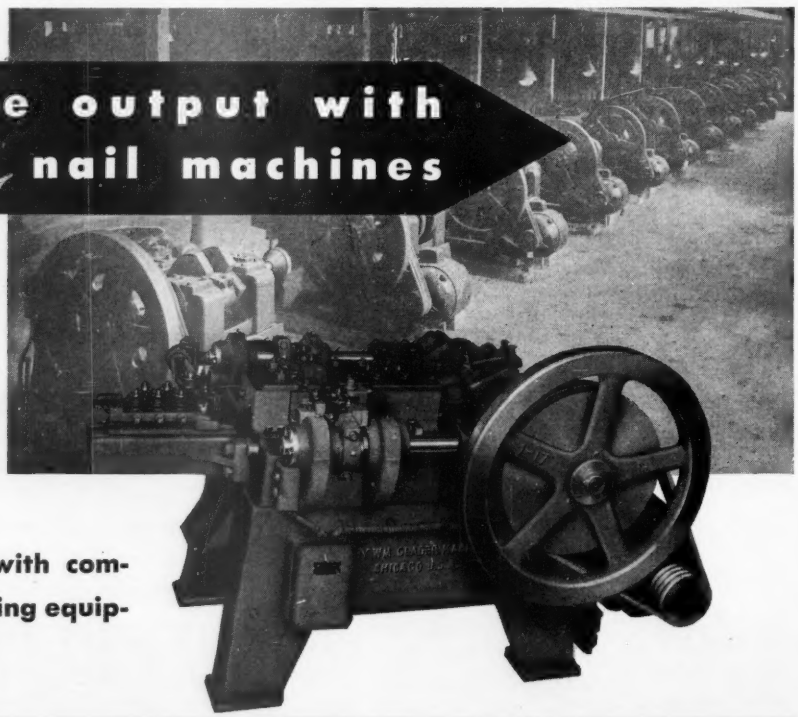
★ ★ ★

Author of over 30 technical papers on the physical and process metallurgy of iron and steel, Mr. Loria has done original research on alloy and sheet steels covering transformation, kinetics, metallography, processing and heat treatment. His work has been cited in recognized references and texts on these subjects.

Becomes Plant Manager of National Screw

Price Berrien has joined the **National Screw & Mfg. Co.,** Cleveland, as general plant manager. He formerly was plant manager for Russell, Burdsall & Ward Bolt & Nut Co., Los Angeles.

high tonnage output with GLADER wire nail machines



A size and type machine available to make everything from tacks and brads to 12" spikes with maximum efficiency.

Write for 12 page bulletin with complete information on nail making equipment.

WM. GLADER MACHINE WORKS
210 N. RACINE AVENUE
CHICAGO 7, ILLINOIS
Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Carpenter Opens Company's Dayton Facilities

An open house commemorating the opening of a new and modern mill-branch warehouse and office for **The Carpenter Steel Company** in Dayton was held September 24, 1954.

★ ★ ★

Visitors from the Carpenter home office in Reading, Pa. included **J. H. Parker,** Chairman of the Board; **O. V. Greene,** General Sales Manager; **G. E. Brumbach,** Metallurgist; **E. Von Hambach,** Research and Development Engineer; **M. J. Holleran,** Assistant Manager of Tool Steel Sales; **M. H. Goodman,** Manager of Alloy Steel Sales and **J. S. Pendleton,** Metallurgist.

★ ★ ★

The new warehouse, located at 229 Leo Street, was constructed to meet the increasing needs for prompt service on Carpenter Tool, Stainless and Special Purpose Alloy Steels. Here, in one completely equipped building, are the most modern facilities, designed to provide fast and efficient service. It replaces an old warehouse.

★ ★ ★

The Dayton warehouse is under the supervision of **W. C. Kunkelman,** Southeastern District Manager, with **R. P. Uhl,** Branch manager, in charge of the warehouse and office. It is also the headquarters for **W. R. Miller** and **D. F. Ross,** representatives.

Anaconda Announces Sales Department Changes

David E. Allen recently appointed Vice President in Charge of Sales, **Anaconda Wire & Cable Co.,** announces the following changes in the Anaconda Sales Department.

★ ★ ★

New Sales Manager for the company will be **H. V. Van Valkenburg,** formerly head of district sales in Chicago. He will make his headquarters in the New York offices of the company.

★ ★ ★

C. B. Peck, Jr. has been appointed Manager of Industrial Sales. Mr. Peck, formerly, was Manager of Sales of rubber and plastic insulated products.

★ ★ ★

J. L. Tindale has been named Manager of Utility Sales. Previously he was Manager of Sales for bare and weatherproof power cable and accessories.

★ ★ ★

H. E. West has been appointed to the position of Manager of Contractor Sales. Formerly, Mr. West was Manager of Industrial Promotions.

A. W. Koch continues as Manager of Magnet Wire Sales.

★ ★ ★

Dan Mancini has been appointed Administrative Assistant.

★ ★ ★

Ernest B. Miller, Jr. has been named District Manager for the Chicago Sales District.

★ ★ ★

John N. Ratcliff, Jr. has been appointed District Manager for the Houston Sales District, succeeding Mr. Miller in his former capacity.

SCOVILL
MILL PRODUCTS
BRASS ★ BRONZE ★ NICKEL SILVER ★ ALUMINUM

ALWAYS CLOSE AT HAND

IT'S EASY TO SEE WHY "TOUGH-TO-MAKE" COLD-HEADED BRASS PRODUCTS CALL FOR

SCOVILL EXTRUDED *Cold-Heading Wire*

(Cartridge Brass, 70%)

The availability of two closely controlled tempers makes possible more nearly perfect fabrication of cold-headed brass parts from wire of requisite "flow" characteristics (for heading and extruding), or of essential rigidity (for secondary machining). These two tempers are suitable for 99% of your cold-heading operations.

Scovill Extruded Cold-Heading Wire virtually eliminates—by reason of its higher copper content, production by the Hot Extrusion process, and closely controlled tempers—such defects (attributed to wire) as:

1. Split heads or shanks.
2. "Out-of-round" heads.
3. Inadequate filling out of heads and shoulders.
4. Rough "orange-peel" effect.

Let us help you select the proper applicable temper for A) HEADING and EXTRUDING, or B) HEADING and DRILLING. A trial run will convince you that there is an important difference in your products made from Scovill Extruded Cold-Heading Wire (Cartridge Brass, 70%).

You Can SELL the Difference

Write for full information to:

SCOVILL MANUFACTURING COMPANY

99 Mill Street, Waterbury 20, Connecticut, Waterbury Plaza 4-1171 10SC548

International Wire Products Corp.

Midland Park, N. J.

Fabricators of copper, stainless, monel, and steel strands and cables in the fine sizes.

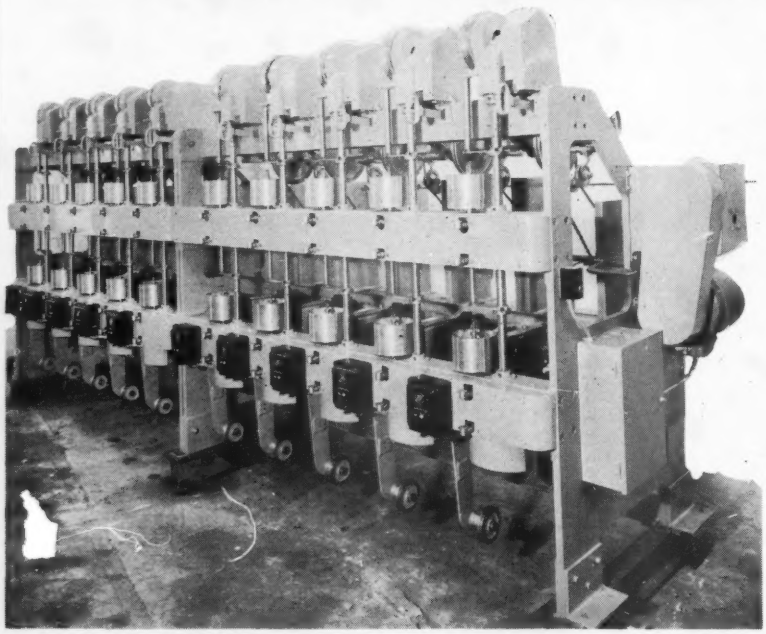
We invite special constructions for experimental cables and strands —for use in Engineering Department work.

We specialize in strands and wire for the costume jewelry trades— Gold colors and silver color strands and wires.

Our facilities include wire drawing, tinning and stranding of single end and multiple wires.

Strand annealing furnace for monel, stainless and silver plate wires —including phosphor bronze and brass from .040 to .002 fine sizes.

2D-10-MBB INSULATION WINDING MACHINE No. 1129



APPLIES DOUBLE COVER TO 10 LINES OF WIRE SIMULTANEOUSLY. NOMINAL WIRE RANGE #15 TO #25 B&S GAUGE (.057" TO .018" or 1.450MM TO .455MM). STANDARD CAPSTANS 8" DIAMETER. SUPPLY WIRE LETOFFS AND TAKE-UPS ARE AT REAR OF MACHINE NOT SHOWN. MACHINE CAN BE ARRANGED SPECIAL WITH 12" DIAMETER CAPSTANS FOR HEAVIER WIRES.

Write today for detailed information

EST. 1855 AIMCo INC. 1915

"American" AIM INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

Anaconda Announces Executive Sales Changes

David E. Allen has been appointed Vice President in Charge of Sales and **Charles H. Porter** and **Maurice J. McCarthy** have been named Commercial Vice Presidents of **Anaconda Wire & Cable Co.,** New York, N. Y. The announcement was made by **H. Donn Keresey,** President of the Company. **L. R. Love,** formerly Vice President in Charge of Sales, will remain as Vice President of the Company, acting in an advisory capacity to the officers.

★ ★ ★

Mr. Allen has served Anaconda W&C in various sales and engineering capacities, most recently as its General Sales Manager. A graduate of the U. S. Naval Academy at Annapolis, he held several positions in the utility industry before joining Anaconda W&C in 1932. He has served in various capacities in Sales and Engineering, both in Headquarters at Hastings-on-Hudson and on field service.

★ ★ ★

Mr. Porter, formerly was Assistant Sales Manager. His previous associations had included Anaconda Copper Mining Co. (Rolling Mill Division), and The American Brass Co., where he was active in that firm's Wire Sales Division. He joined Anaconda W&C in 1929.

★ ★ ★

Mr. McCarthy, previously Assistant Sales Manager, has been with Anaconda Wire & Cable Co. since 1930.

Firth-Loach Appointments

The newest carbide metal producer in the country, **Firth-Loach Metals, Inc.,** McKeesport, Pa., announces the appointment of **Louis De Marco** as Vice President in charge of Sales and Engineering, and of **James E. Gray** as Sales Manager.

★ ★ ★

Before joining Firth-Loach Metals, Mr. De Marco was associated with **Firth-Sterling** from 1950 to 1953—rising to the position of Assistant Chief Engineer, Carbide Division. Prior to that he was Eastern Sales Manager for **Vascoloy-Ramet Company.** His two decades in carbides also include service as Tool Efficiency Expert for 38 General Motors plants, and special assignment work for General Knudsen of the Office of Production Management during World War II. The author of several articles on tool design, he studied at Worcester Polytechnic Institute.

★ ★ ★

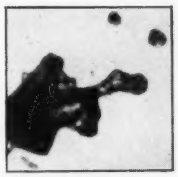
After attending Carnegie Institute of Technology, **James E Gray,** became one of the earliest men in the field. He began his career in 1929 in the carbide department of Firth-Sterling, and gained extensive experience in raw powder processing, inspection, engineering, inventories and pricing. He was appointed Supervisor of Carbide Sales in the Chicago District in 1949, and made Assistant Sales Manager of the Carbide Division in 1953.

TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St. Stamford, Conn.

DIADUST

The finest always costs a little more

. . . but fines cost the most. DIADUST* *quality* is worth paying for, but fine particles mixed with any given size, go along just for the ride and do no work.



Ordinary
6-12 Micron
Magnification
1000 X

DIADUST, made by a special process, gives you *quality* without the unwanted fines. Every particle of DIADUST carries its own share of the work load.

DIADUST
6-12 Micron
Magnification
1000 X

Buy DIADUST with the utmost confidence in its uniform quality and greater effectiveness.

*Registered

MEMBER

UNITED STATES Industrial DIAMOND CORP.
SALES MGT. BY
DIAMOND DISTRIBUTORS, INC.
589 Fifth Ave. Tel. PLaza 9-8383 New York 17, N. Y.

Named Vice President of Hubbell Metals

Hubbell Metals Inc., of St. Louis, Missouri, has announced the appointment of **Donald M. Hanson** as a vice president in charge of merchandising. Mr. Hanson has been active in the **Copper and Brass Warehouse Association** and was made president of the Association last March. He has been associated with Hubbell Metals for fourteen years. In addition to his duties as vice president of Hubbell, he will continue as manager of the brass & copper department.

★ ★ ★

Mr. Hanson attended Washington University in St. Louis and spent three and a half years in the Army Air Corps., enlisting as a private and advancing to the rank of major. He is a member of the St. Louis chapter of American Society for Metals, and the St. Louis Electrical Board of Trade.

To Edit CF&I Publication

Algird C. Pocius has been appointed Editor of "The Blast", industrial publication of the **Colorado Fuel and Iron Corporation,** it was announced by **G. A. Sabin,** director of advertising for CF&I.

★ ★ ★

"Switching to NILSON 4 SLIDES Saved us $17,656 on metal alone"
Yes, simply by changing stamping methods, this NILSON Customer profited 4 ways:
1. Production increased 80%.
2. 72% less metal used (per 4 million pieces).
3. Greatly improved quality with minimum of rejects.
4. Strengthened competitive position with greater profit margin.
You, too, can enjoy these advantages in producing your own wire forms and small metal stampings. Parts such as illustrated in the margin were straightened, fed, pierced, blanked, swaged, stamped or coined, cut-off and formed AUTOMATICALLY in NILSON 4 SLIDES in one quick precise operation. ONE Machine. ONE Operator.
NILSON 4 SLIDES available in wide range of sizes: forming Wire up to ½" diam. in feeds to 32" max. and Metal Ribbon stock up to 3½" wide. Press sections 5 to 30 ton capacity. Heavy Duty Types in 50 and 75 ton models.
MODEL S-3-F Nilson 4 Slide with No. 51B Nilson Tilting Stock Reel.
THERE'S NOTHING LIKE A NILSON
Write, Wire, Phone for full particulars.
THE A. H. NILSON MACHINE COMPANY
1516 Railroad Avenue • Bridgeport 5, Connecticut
Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

Mr. Pocius served as editor of the Acme Steel News, the industrial publication of the Acme Steel Company of Chicago, from 1948 until his present appointment. He started with Acme 13 years ago in the machine shop and as plant reporter.

★ ★ ★

During World War II, he served 41 months in the Armed Forces, enlisting in the Signal Corps and later being transferred to the Air Corps. He attended Northwestern University and Iowa State University.

★ ★ ★

C.F.&I. Elects Officers

The stockholders of **The Colorado Fuel and Iron Corporation** voted at its annual meeting to reelect **Alwin F. Franz, Arsene C. Bekaert, Charles R. Tyson,** and **William M. White** as directors of the Corporation, it was announced by **Charles Allen, Jr.,** chairman of the board of directors. Their terms of service are for three years.

★ ★ ★

At a special meeting immediately following the annual meeting, stockholders approved amendments to the Corporation's pension plan. The amendments, required because of recent labor agreements with various unions, will benefit principally lower wage earners.

★ ★ ★

CF&I, with 14 plants in seven states, has a rated ingot capacity of 2,466,000 tons a year, and manufactures a wide range of products for many of America's principal steel-consuming industries.

★ ★ ★

Appointed Head of Steel Section of International Nickel

William H. Sparr, Jr. of Pittsburgh, has been transferred to New York and appointed in charge of the Steel Section of the Nickel Sales Department of **The International Nickel Company, Inc.,** effective November 1, 1954, it was announced by **Lars R. Larson,** Vice-President and General Sales Manager. Mr. Sparr, who will hereafter have his headquarters in New York, will devote himself to sales

of nickel in the Steel Section.

★ ★ ★

Joining International Nickel in New York in 1946, Mr. Sparr was assigned to steel matters in the Development & Research Division. Prior to his appointment announced today, he was head of the Development & Research Division's Technical Field Section in Pittsburgh, having served as a member of that section for eight years.

Top Salesman for Apex Alkali in '53 Gets Vacation Award

John Donaldson sold the greatest dollar volume of new business

John Donaldson

for 1953 and won a two weeks' all-expense vacation for himself and family in Florida.

★ ★ ★

As technical field representative for Apex, he covers the Eastern Pennsylvania, New Jersey and New York City areas.

★ ★ ★

Many thanks to all who helped John Donaldson attain his goal.

Sheet & Tube Has New General Sales Manager

John M. Tuthill, assistant general manager of sales for **The Youngstown Sheet and Tube Company,** has been appointed general manager of sales effective November 1st. Mr. Tuthill, who was in the Chicago office, will transfer to the main office in Youngstown.

John P. DeHetre, who was appointed an assistant general manager of sales last June, with his office in Youngstown, was transferred to Chicago to succeed Mr. Tuthill as of November 1st. The appointments were announced by **Myron H. Watkins,** recently elected vice president of The Youngstown Sheet and Tube Company.

Made Assistant General Manager of U.S. Rubber Division

Appointment of **G. Allen Lovell** as assistant general manager of the mechanical goods division, United States Rubber Co., has been announced. He replaces **Herbert G. Kieswetter** who has been named executive assistant to the general manager of the company's international division.

★ ★ ★

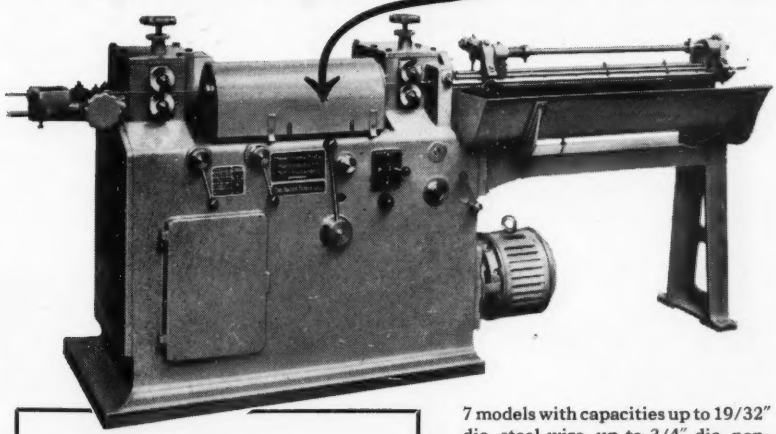
Mr. Kieswetter will supervise activities of the international division in Great Britian and Europe, including relations with affiliated and associated companies and with the sales organization and customers of the division in that area.

★ ★ ★

Mr. Lovell will have responsibility for supervising production and

M R+P

AUTOMATIC WIRE-STRAIGHTENER AND CUTTER
a little oscillation (here) makes a difference



Oscillation

The MR&P straightening jig rotates, of course, but it also oscillates while wire is being cut. This is done to protect the material against breakage. Ordinarily, the heat and stress which are produced by the rotation of the straightening jig would be concentrated in one section of wire during a cut-off, but thanks to oscillation, it is distributed instead. Thus, the wire is protected, which is very important when straightening fine or brittle wires.

7 models with capacities up to 19/32″ dia. steel wire, up to 3/4″ dia. nonferrous.

6 feeding speeds, up to 230 ft. of straightened and cut wire per minute.

Accurate: wire cut 40″ long has length and straightness tolerances within ±.005″.

Straightening jig has 2 different speeds: 4000 rpm and 6000 rpm.

2 pairs of feed rollers permit proper feeding of all kinds and sizes of wire. Soft material is not marked or deformed because of special elastic feeding pressures.

When straightening extremely fine and easily fractured wires, automatic clutch can be supplied for disengaging feed rollers during cut-off.

Write for bulletin.

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

research as well as sales operations in the mechanical goods division. He will make his new headquarters in New York.

★ ★ ★

The mechanical goods division operates plants in Passaic, N. J., Fort Wayne, Ind., Philadelphia, Pa., Bristol, R. I., Chicago, Ill., and Sandy Hook, Conn. It manufactures industrial and fire hose, conveyor belts, transmission belts, V-belts, packing, tape, automotive rubber products, insulated wire and cable, plastic pipe, grinding wheels and hundreds of other industrial products.

William Adam, Jr.

We regret to announce that **William Adam, Jr.,** President of **Ajax Electric Company,** Philadelphia, Pa., died on November 1, 1954. Mr. Adam was well-known for the development work he had done to bring salt bath furnaces and heat-treating processes to a point of high efficiency.

Entwistle Sales Office Moved

Kenneth J. Gillett, sales representative for the **James L. Entwistle Co.,** Providence, R. I., manufacturers of wire equipment, has announced the removal of his offices from Yonkers, N. Y., to P. O. Box 706, Englewood, N. J. The move was made in November.

Appointed Head of INCO'S Pittsburgh Technical Field Section

C. T. Haller, Jr., has been appointed in charge of the Pittsburgh, Pennsylvania, Technical Field Section of the Development and Research Division of **The International Nickel Company, Inc.,** it was announced by **Donald J. Reese,** Assistant Manager of the Division.

★ ★ ★

Mr. Haller, whose appointment became effective November 1, 1954, succeeds **William H. Sparr, Jr.,** who has been transferred to New York and appointed in charge of the Steel Section of the company's Nickel Sales Department.

★ ★ ★

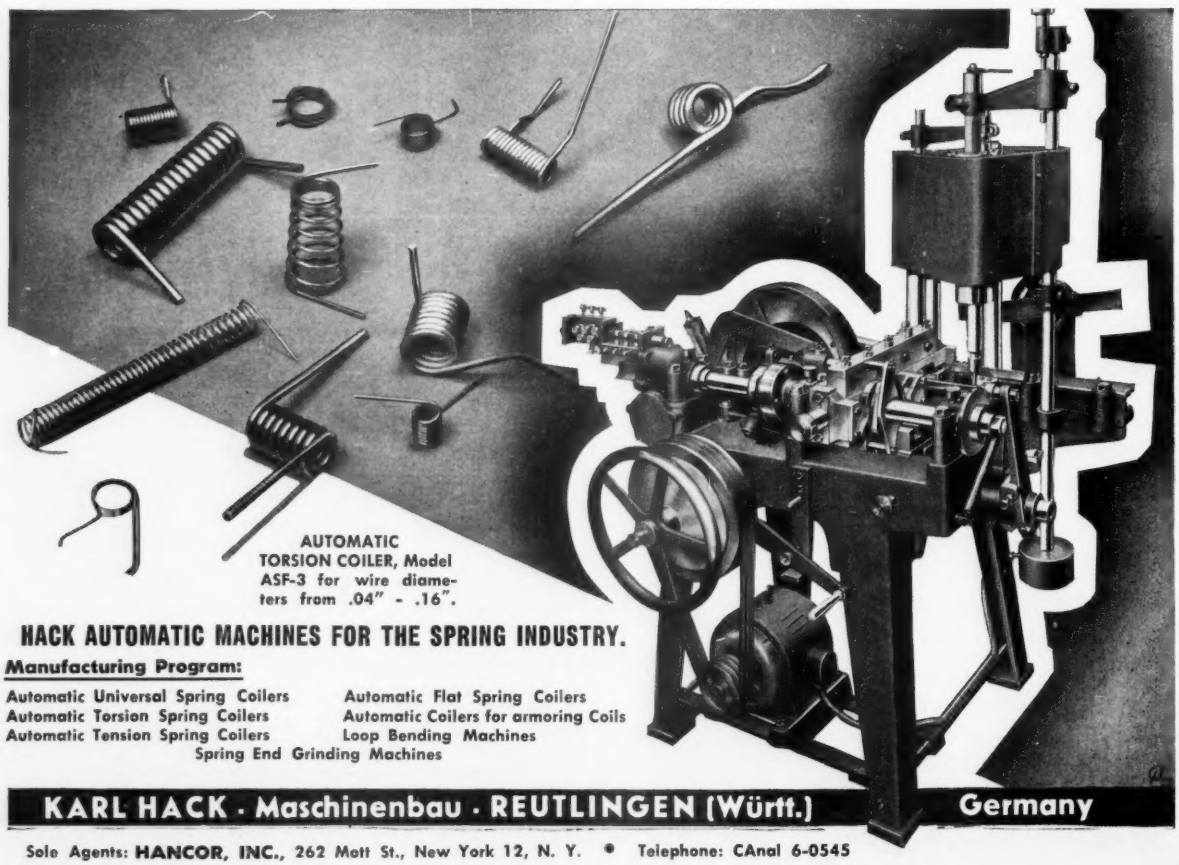
A metallurgist, Mr. Haller joined International Nickel in January, 1945, as a member of the Pittsburgh Technical Field Section. He was appointed in charge of the Cincinnati, Ohio Technical Field Section in 1951.

Basket Firm Names Distributors

Wiretex Mfg. Co., Fairfield, Conn., maker of baskets for plating, heat-treating, production and maintenance, has appointed the following jobbers: **Armalite Co. Ltd.,** Toronto, Ont.; **Davies Supply & Mfg. Co.,** St. Louis; **R. O. Hull & Sons,** Rocky River, O.; **Jelco Products Co.,** New York; **Pesco Plating Equipment & Supply Co.,** Brooklyn, N. Y.; and **Schnitzer Alloy Products Co.,** Elizabeth, N. J.

★ ★ ★

These concerns will sell Wiretex products in their respective territories.


AUTOMATIC
TORSION COILER, Model
ASF-3 for wire diameters from .04" - .16".
HACK AUTOMATIC MACHINES FOR THE SPRING INDUSTRY.
Manufacturing Program:
Automatic Universal Spring Coilers
Automatic Torsion Spring Coilers
Automatic Tension Spring Coilers
Automatic Flat Spring Coilers
Automatic Coilers for armoring Coils
Loop Bending Machines
Spring End Grinding Machines
KARL HACK · Maschinenbau · REUTLINGEN (Württ.) Germany
Sole Agents: HANCOR, INC., 262 Mott St., New York 12, N. Y. • Telephone: CAnal 6-0545

A Review of Recent Wire Patents

No. 2,691,057, INSULATED CONDUCTOR, patented October 5, 1954 by David A. McLean, Chatham, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

Between the wire conductor and layer of solid insulating material is interposed a layer of viscous, normally liquid insulating material of lower dielectric strength than the solid insulating material and having dispersed therethrough finely divided particles of carbon in an amount of at least 0.1 per cent of the weight of the liquid insulating material but not in an amount sufficient to lower the resistivity of the latter appreciably below 10^{15} ohm-centimeters.

★ ★ ★

No. 2,691,864, WIRE ROPE MAKING MACHINE, patented October 19, 1954 by Russell F. Delp, Northumberland, Pa.

The machine includes a main power source, a twisting die, a device operated by the power source to rotate the die at constant speed, a rotatable bobbin frame, a wind-up bobbin in this frame, means operated by the power source to rotate the bobbin to draw a number of wires into a twisted strand through the die, a jack shaft, a drive connection between the die and jack shaft, a head slidable longitudinally upon the jack shaft, a device governed by the linear speed of the strand for moving this head on the jack shaft, and a device interposed in the bobbin rotating means governed by the sliding movements of the head for varying the speed of the bobbin rotating means.

★ ★ ★

No. 2,692,042, WIRE DRAWING MACHINE, patented October 19, 1954 by Edwin J. McIlvried and Norman H. Nye, Cuyahoga Falls, Ohio, assignors to The Vaughn Machinery Company, Cuyahoga Falls, Ohio, a corporation of Ohio.

This machine is provided with a vertical panel, a number of closely spaced wire drawing drums mounted on horizontal axes accurately arranged about a common center on this panel, and wire drawing dies arranged and disposed tangentially to the sides of the corresponding drums toward such center; a central lubricant supply chamber, and a number of lubricant discharge ducts pivotally connected with the chamber for swinging movement toward and away from the die openings of the respective dies.

★ ★ ★

No. 2,692,189, CHEMICAL POLISHING SOLUTION AND METHOD, patented October 19, 1954 by Bo-Shin Ro, Tokyo, Japan, assignor to Khe-Beng Chiong, San Diego, Calif.

A method is disclosed of producing a high lustre on the carbon steel, special steel, aluminum and aluminum alloys by immersing the metal in an anhydrous bath at a temperature of 120°C. to 260°C. for a period of time less than 60 seconds, the bath consisting of an acid selected from the group consisting of meta-phosphoric acid and pyrophosphoric acid and at least one substance selected from the group consisting of tartaric acid, oxalic acid, ferrous sulphate and sulfuric acid.

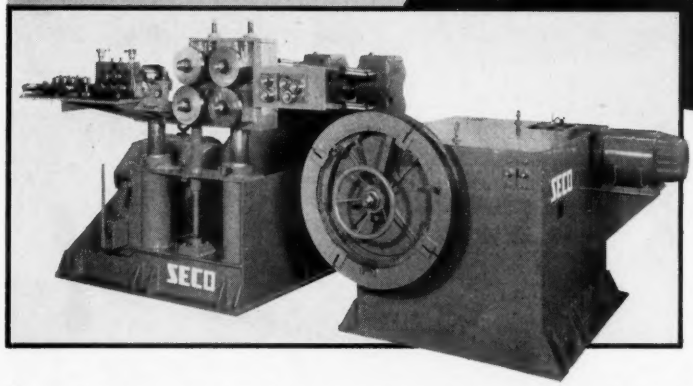
★ ★ ★

No. 2,692,218, METHOD OF MAKING INSULATED WIRE, patented October 19, 1954 by Frederick H. Nicoll and David W. Epstein, Princeton, N. J., assignors to Radio Corporation of America, a corporation of Delaware.

The method of making an insulated electrical conductor suited for use in elevated temperature environment is disclosed and comprises coating an electrical conductor with an adhesive binder inherently decomposable by the elevated temperatures to form readily mobile decomposition products adverse to the normal operating conditions of the conductor, covering the conductor, through the aid of the adhesive under lowered temperature conditions, with a glass-insulating material having a melting temperature below the predetermined

Outstanding Features
Superior Performance

NEW Heavy Duty COILER
for Electrode Wire
DOES ALL THESE OPERATIONS



1 - STRAIGHTENS 2 - MEASURES
3 - FEEDS 4 - PRECASTS 5 - COILS

This Coiler handles welding wire of 3/32" to 3/8" diameter at 200 to 800 F.P.M. on blocks of 12" to 25" diameter.

Mechanically it consists of two separate units: the first doing the straightening, measuring, feeding and pre-casting of the wire, the second doing the coiling only.

Electrically both units are tied together in as much as all motors are controlled from one VS drive and control unit.

• Puts a predetermined cast in the wire prior to its coiling on the block.

• Makes a traverse wound coil which will easily uncoil although being close and tightly wound with no danger of springing open.

• First unit equipped for hydraulically raising or lowering the entire roll assembly for proper lineup with the block diameter.

• Complete control over traverse mechanism for delaying reversal at stroke ends.

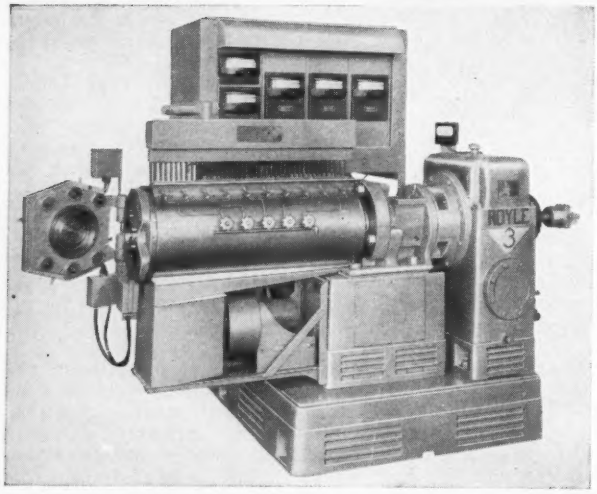
• Compact construction with easy accessibility to all moving parts.

Write for full information and data—or consult our engineers on your coiling problems—no obligation.

STEEL EQUIPMENT CO. 20805 AURORA ROAD CLEVELAND 22, OHIO

SECO

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.
REgent 2430	SHerwood 2-8262	SWandale 4-5020	LOgan 3261

PATERSON 3, NEW JERSEY

Here is the difference between just any reel and MPS reels with
DURA CURL RIMS
Yes, it's the exclusive MPS heavy duty thickened-section rims that assure maximum strength and rigidity throughout the reel heads. Flange run-out and straightening expenses are eliminated by this patented MPS development. DURA-CURL rims are now standard on all MPS wire drawing, annealing, and stranding spools and reels. We invite your inquiries — let us tell you more about Dura-Curl rims.
MPS
trouble-free winding spools and reels
Mossberg PRESSED STEEL Corporation
18 WEST STREET • ATTLEBORO • MASSACHUSETTS, U. S. A. TEL ATTLEBORO 1-0848
JAMES DAY (MACHINERY) LTD. 28 MADDOX STREET, LONDON W. 1, ENGLAND

elevated temperature environments, heating the so-formed insulated conductor to a temperature permitting decomposition of the adhesive, and removing the products of adhesive decomposition from between the conductor and insulating material.

★ ★ ★

No. 2,692,620, METHOD AND APPARATUS FOR MAKING DOUBLE CONICAL TORSION SPRINGS, patented October 26, 1954 by Curt H. K. Sjobohm, Worcester, Mass.

Included are a stationary wire cutter adjacent to conical arbor through which wire is fed, a cylinder mounted in alignment with this and a second arbor at the large diameter end of the second arbor, a piston rod connected to a piston within the cylinder and connected to the second arbor so that the second arbor will be held against the first arbor during formation of the spring, and a cutting blade adapted to cooperate with a wire cutter to sever the wire when the spring is completed.

★ ★ ★

No. 2,692,853, PROCESS AND COMPOSITION FOR ELECTROPOLISHING STAINLESS IRON AND STEEL, patented October 26, 1954 by Terry S. Gamble, Shawinigan Falls, Quebec, Canada, assignor to Shawinigan Chemicals Limited, Montreal, Quebec, Canada, a corporation of Canada.

An electrolyte for use in the electrolytic polishing of stainless iron and steel articles wherein the article is employed as an anode is disclosed and consists essentially of an acid of the group consisting of sulfuric and orthophosphoric acids and mixtures thereof, water, and an amount of a material of the group consisting of humic acid and alkaline salts of humic acid effective to produce a bright polish over a wider range of acid concentration, temperature, and current density than in the absence of the member of the group.

★ ★ ★

No. 2,690,614, CAN PUNCH, patented October 5, 1954 by Floyd D. Lee, Pontiac, Mich.

The device is constructed of several lengths of stout wire formed into a punch-carrying ring and a handle portion.

★ ★ ★

No. 2,690,983, PROCESS OF REMOVING RUST AND INHIBITING FURTHER RUSTING, patented October 5, 1954 by Joseph G. Meckler, South Euclid, and Maurice C. Meckler, University Heights, Ohio, assignors to The Kromite Products Company, Bedford, Ohio, a corporation of Ohio.

A process of treating plated metal surfaces, for eliminating rust from a chromium-plated surface on an iron base by applying moistening water and a small amount of polycalcium silicate and aluminate powder to a fabric, allowing action between the moistening water and powder for a few moments, then lightly rubbing such fabric on the rust-affected iron base chromium plated metal surface, and wiping dry.

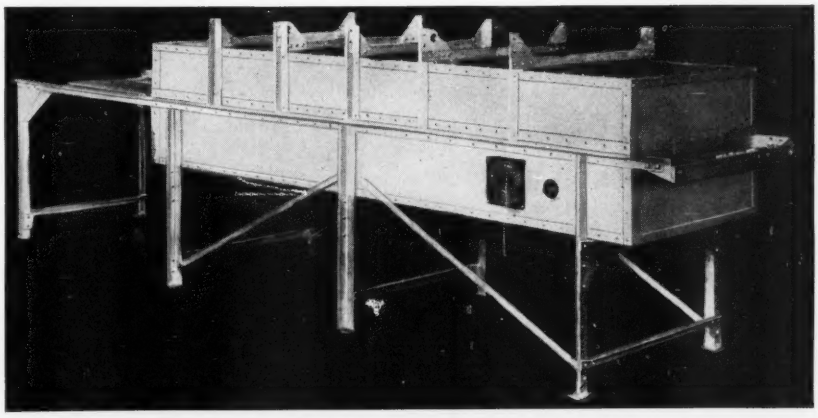
★ ★ ★

No. 2,690,984, ELECTRIC CABLE JACKET, patented October 5, 1954 by Eugene L. Crandall and Vincent A. Sheals, Schenectady, N. Y., assignors to General Electric Company, a corporation of New York.

More specifically the invention applies to a method of applying an outer jacket for the metallic sheath of a wire conductor.

The information in this section is furnished by the patent law offices of LANCASTER, ALLWINE & ROMMEL, 438 Bowen Bldg., Washington 5, D. C. Data listed is only a brief review of recently issued patents obtained by various U. S. Pat. Off. registered attorney for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommel by sending 50¢ for each patent desired. Outside of the U. S. and Canada the cost is $1.00 for each copy.

ROCKWELL FURNACES for Strand Bright Annealing...

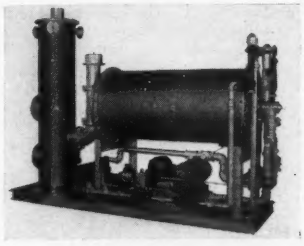


Rockwell electrically heated furnace for continuous strand bright annealing of fine steel, stainless steel or non-ferrous metal wire. Top of furnace is removable for easy servicing of elements and muffle tubes. This is but one of many Rockwell electric or fuel-fired, batch and continuous furnaces, direct heated, muffle or radiant tube type, for annealing, bright or clean annealing, hardening and drawing wire.

ROCKWELL ALSO BUILDS

- **Batch and conveyor type ovens for aging, annealing or drying insulated magnet wire.**
- **Complete processing equipment for enameling, tinning, glass coating or synthetic coating magnet wire.**
- **Gas generators to provide protective atmospheres for bright annealing.**

We invite your inquiries.



Rockwell 6000 C.F.H. gas atmosphere generator.

W. S. ROCKWELL COMPANY

ROCKWELL SINCE 1888 BUILT

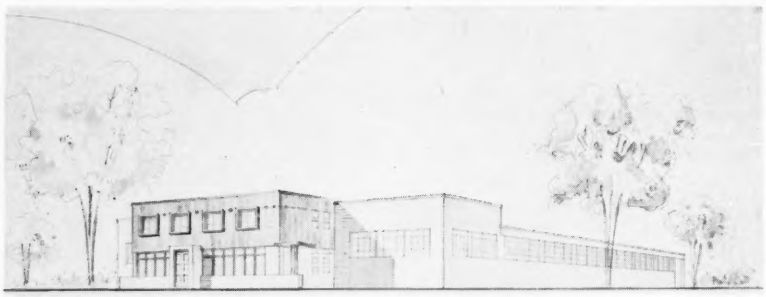
FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY

2424 ELIOT STREET • FAIRFIELD, CONN.

Sales Representatives in Principal Cities

Canadian Reel Company Plans Expansion

The J. Hamelin Lumber and Woodwork Ltd., has announced plans for further expansion through the building of another plant.



The J. Hamelin Lumber & Woodwork, Ltd.

The company started operations in 1938 with a policy of giving its customers the best possible products and service at the best possible prices. This policy has been adhered to over the years and on many occasions when others were advancing prices, Hamelin was often able to announce price reductions!

★ ★ ★

This was made possible by an accurate system of cost controls and efficient production methods. The policy has contributed greatly to the reputation the company now enjoys in serving Canadian cable, rope and wire manufacturers.

★ ★ ★

Starting on the proverbial shoestring in a 10′ x 20′ garage, larger premises had to be found every so often until 1946, when the company built its first plant. In 1952 an 8000 feet extension was added to this plant and now through the adding of special reel making and other modern machinery, it has been decided to build a new plant.

★ ★ ★

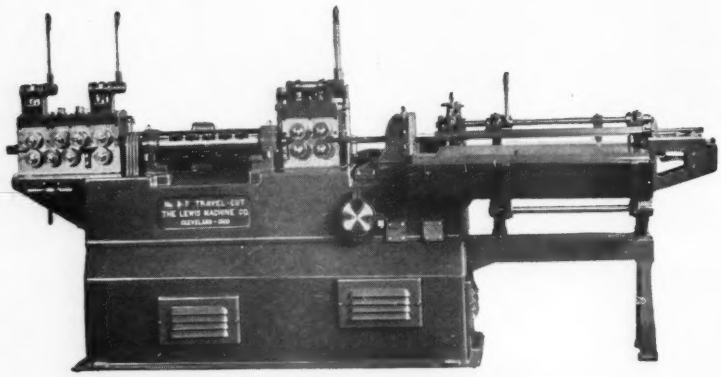
This plant will have 30,000 feet of floor space on one floor and will be located on 10 acres of land that has just been purchased. The company sincerely believes that with this further expansion it will be in a position to furnish better reels and better service, at better prices than before.

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT

(Trademark)



23 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL-CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL-CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California.

CANADIAN: Empire Engineering Co., 738 Dundas St., East, Toronto, Ont., Canada.

CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

New pH Instrumentation Systems

Complete systems for pH recording and control, which incorporate for the first time the new Beckman Model W amplifier, have just been announced by **The Bristol Company** of Waterbury, Conn.

★ ★ ★

These pH instrument systems include a Bristol Electronic Dynamaster Potentiometer recorder or controller, a Beckman Model W Amplifier, electrode assemblies in either flow or immersion types, and a variety of final control elements for the addition of gaseous, liquid, solid, or slurried reagents.

★ ★ ★

Bristol's new bulletin Q1304

gives full engineering specifications and illustrations of each component of the systems, and shows methods of installing pH instruments in a number of different applications. It also contains photos of installations in various fields of manufacture. The 38 page, two-color bulletin is available on request.

New Machine for Straightening and Cutting Square and Rectangular Wire

Square or hex wire, 3/16" to 1/4", or flat wire 1/16" x 1/4" to 3/32" x 1/2" are straightened and cut automatically on the model 2ABF, latest of a long line of SHUSTER straightening equipment manufactured by **Mettler Machine Tool, Inc.,** New Haven, Connecticut. Multiple sets of precision straightening and feeding rolls handle the wire easily and uniformly, for long production runs. Predetermined lengths are cut with Shuster accuracy, the result of long and proven development of the instantaneous clutch and cut-off. There is almost continuous wire movement, minimizing marking and assuring square cut ends. Well-known Shuster features of construction, ball and roller bearings, v-belt motor drive and automatic controls are combined in the 2ABF to finally solve the problem of straightening square and rectangular wire.

Bulletin Describes Revolutionary High Speed Threader

A new, 4-page bulletin published by the **Waterbury Farrel Foundry & Machine Co.,** covers a completely new type of thread rolling machine which uses planetary dies to thread up to 2,000 blanks per minute.

★ ★ ★

The two-coler, file-sized brochure describes and illustrates the new machine in detail. Close-up views show the circular die arrangement which can thread all standard types of machine screws—round, button, truss, binder, fillister, flat and similar heads. The bulletin points out that planetary die life exceeds that of flat dies because blanks may be rolled a few more revolutions than is possible in a flat die machine of comparable size.

★ ★ ★

Detail photographs also show the spiral feed rolls and clearing wheels, the feeding arrangement, the spring safety clutch feature and the discharge end of the threading unit. Descriptive matter explains each feature of the machine including lubrication, electrical equipment and tooling. A table of specifications on the unit is provided.

★ ★ ★

The bulletin also mentions the Waterbury high speed slotter which matches the new threader in production capacity.

★ ★ ★

Free copies of this new threader circular are available from the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Ask for circular No. 942-A.

Bulletin on Brazing

A new bulletin on low temperature brazing has been issued by **Handy & Harman,** 82 Fulton St., New York 38, N. Y.

★ ★ ★

130 year old

PLYMOUTH
CORDAGE COMPANY
announces
THE PLYMKRAFT DIVISION

established to serve
THE WIRE INDUSTRY
Staffed by top-flight engineers available for consultation on any cable filler problems.

PLYMKRAFT
Improved Cable Filler
Made To Fine Tolerance
Always Uniform
Twisted To Your Exact Specifications

Available in any type of put up to conform with your equipment requirements. Facilities for applying any type of treatment—such as wax, jute, saturant, anthracene.
Write for Samples

PLYMOUTH CORDAGE COMPANY
Plymouth, Massachusetts
New Orleans, Louisiana

PLYMOUTH TRADE MARK 1824

In it is described and illustrated various brazing operations using "Easy-Flo" and "Sil-Fos", two silver brazing alloys that make for high-strength joints at relatively low temperature.

★ ★ ★

Copies of this bulletin, No. 66, are available upon request.

New Aluminum Welding Electrode Developed

To provide maximum weld quality in the inert-gas, shielded arc welding of aluminum, **Aluminum Company of America** has developed a new high quality welding electrode.

★ ★ ★

The new consumable electrode, which was produced to achieve weld soundness as required in Navy specifications for this type of product, is expected to set a new standard of quality for inert gas welding of aluminum.*

★ ★ ★

Strict quality standards aided by Alcoa research and production advances have made the superior aluminum electrode possible. Each lot of the product, called Alcoa I. G. (Inert Gas) Welding Electrode, is carefully tested by welding in the overhead position.

★ ★ ★

The new Alcoa electrode was designed to be used in the welding guns employed with existing consumable electrode, shielded arc processes.

★ ★ ★

It conforms with American Welding Society specification A5. 10-54T (tentative 3/17/54) and ASTM specification B-285-54T.

★ ★ ★

Further information on this electrode can be obtained by writing to Aluminum Company of America, 738 Alcoa Building, Pittsburgh 19, Pa.

Introduces A New Two-Wire Thermocouple

A new two-wire thermocouple, encased in stainless steel tubing, has been introduced by the Industrial Division of **Minneapolis-Honeywell Regulator Company.**

★ ★ ★

The new device is available with either of two types of terminal heads: an open head assembly or a screw-cover head. The latter comes in two sizes. The stainless steel protecting tube is expected to double the life of the new thermocouples. Accuracy of the new device is rated at plus or minus 5°F over a range from 0° to 1000°F.

★ ★ ★

Fiberglass insulation in the new model thermocouples permits greater application flexibility than is possible with the ceramic-insulated pencil-type models.

★ ★ ★

Lengths of the thermocouples range from 6 inches to 60 inches. Lengths of 35 feet are available on a special basis.

★ ★ ★

* Spec. MIL-E-16053-B Ships 21 May, '53.

Refinishing Wire Drawing Dies?

Save Money with NORBIDE® Abrasive . . .

Second in hardness only to diamond which costs a hundred times more

Johnson Steel & Wire Co., Inc. has substantially reduced the cost of refinishing their wire drawing dies by substituting NORBIDE Abrasive for costly diamond dust. Excellent for ripping or for fast stock removal as well as for accurate semi-finishing operations.

High accuracy is important to Johnson for Johnson "music" spring wire is drawn in 200 different sizes, all the way from .003″ to .200″.

If you are still using diamond dust for your ripping and semi-finishing operations, you'll be amazed at the savings you can obtain by switching to NORBIDE Abrasive.

For cost-cutting abrasive details, write for Form 559.

NORTON COMPANY

45 New Bond Street • Worcester 6, Massachusetts

NORTON

BORON CARBIDE

NORBIDE® . . . the hardest man-made abrasive

ASTM Standards on Copper and Copper Alloys

This book brings together in compact, readily usable form all of the ASTM Standards pertaining to copper and copper alloys, which were developed by ASTM Committee B-5 on Copper and Copper Alloys, Cast and Wrought, and related standards from other committees of the American Society for Testing Materials.

★ ★ ★

This edition includes in their latest form 123 ASTM standards, including 108 specifications; 10 test methods; 2 classifications: one of coppers, the other of cast copper-base alloys; 2 recommended practices: one for tension test specimens for copper-base alloys for sand castings, and one for designating significant places in specified limiting values; and 1 hardness conversion table for cartridge brass. 50 of the specifications included in the earlier edition have been revised and 8 of the standards are new.

★ ★ ★

New material includes specifications and test methods for: round chromium-copper wire for electronic devices; seamless copper tube for refrigeration field service; soft or annealed coated copper conductors for use in hookup wire for electronic equipment; copper-zinc-manganese alloy (manganese brass) sheet and strip; determination of cross-sectional area of stranded conductors; stiffness of bare soft square and rectangular copper wire for magnet wire fabrication; and various alloy castings.

★ ★ ★

Standards cover: specifications for electrical conductors; plate, sheet, rolled bar, and strip; rod, bar, and shapes; non-ferrous metals; wire; pipe and tube; ingot; sand and die castings; filler metal; and methods of test for copper and copper-alloys.

★ ★ ★

Copies of this 600-page publication, heavy paper cover, can be obtained from the **American Society for Testing Materials,** 1916 Race Street, Philadelphia 3, Pa., at $5.00 per copy; $5.65, cloth cover.

New Pin Making Machine Perfected

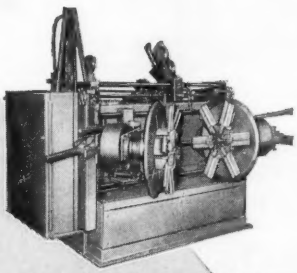
The L. R. Brown Manufacturing Co., 134C Mill River St., New Haven, Conn., has designed, perfected, and is now in production on a high speed pin machine of unusual merit. This machine, we are told, will cut pins from 1/8" to 3/16" diameter wire in lengths from 7/16" to 4¾" at from 18,000 to 75,000 per hour, holding lengths to plus or minus .0025. These pins are said to emerge with perfect ends, requiring no tumbling to remove burrs.

★ ★ ★

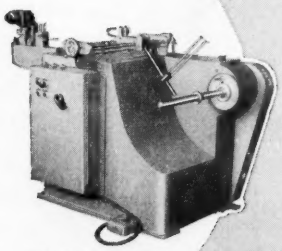
The Brown High Speed Pin Machine is driven by a 3 HP electric motor. It has a straightening arbor to straighten the stock as it enters, and an adjustable micrometer stop for length. The machine can be changed from one size wire pin to another in ten

FOR FASTER MORE EFFICIENT WIRE PRODUCTION . . . . . .

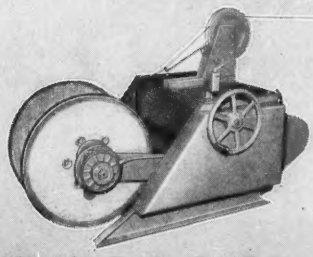
WIM EQUIPMENT



Fully Automatic Continuous Coiler and Respooler



Variable Speed, Constant Footage Respooler



Adjustable Tension Payoff Stand

Designed for more efficient wire production, WIM equipment is engineered to save you time, money and effort. Smooth high speed performance is assured. Continuous dependable operation is featured. The result is a line of wire handling machines that will handle your toughest jobs with little or no servicing. Write today for further information. Our engineering staff will be glad to help work out your problems.

WIRE INSULATING MACHINERY, INC.

Division of Machinery Electrification, Inc.

Northboro Mass., U.S.A.

minutes. It carries full guarantee, and the manufacturer will be glad to send samples of pins of brass or steel.

★ ★ ★

Full details will be sent by the manufacturer upon request.

New Wire Enameling Equipment Announced by General Electric

New wire enameling equipment, designed to improve the evaluation of wire enamels in laboratory research, has been announced by the General Electric Company's Industrial Heating Department, Schenectady, N. Y.

★ ★ ★

Designated Type LF, the equipment is also designed for limited production of special enamels. According to G-E engineers, the new product provides low cost equipment which requires little factory floor space, but operates as a production machine.

★ ★ ★

The new wire enameling equipment duplicates the operating conditions of the widely-used G-E horizontal-oven Type LF wire enameling machine in length and shape of baking chamber.

★ ★ ★

G-E Calrod heaters are used to heat the oven. Extremely accurate temperature control is maintained by the proportioning saturable reactor provided by the G-E Reactrol system. Motor driven, roller-die-type applicators are used to coat the wire with enamel. These applicators are capable of handling all of the film-type insulating enamels currently used for the magnet wire industry. Because the same capstan and electric spooler drives found in the production ovens are used, identical tension characteristics are maintained in the new equipment. Applications include work on new enamels, quality control testing of accepted enamels, enamel acceptance testing by wire manufacturers, plus, the limited production of special enamels.

New Spring Device Exerts Constant Force in Compression

The Flex'ator, a new spring device that exerts virtually constant forces in compression, is now available to mechanical engineers as a versatile new loading element for product design in many segments of the machinery and metalworking industries. Developed by the **Hunter Spring Company***, Lansdale, Pa., the Flex'ator looks like an extension spring and functions as a compression spring but has unique operating characteristics because it exerts force by being flexed under load, rather than stretched or squeezed. While the loads of conventional extension and compression springs inherently increase with deflection, the force output of the Flex'ator may be either increasing, decreasing or substantially constant—a constant force independent of deflection certainly being the most significant characteristic to mechanical designers.

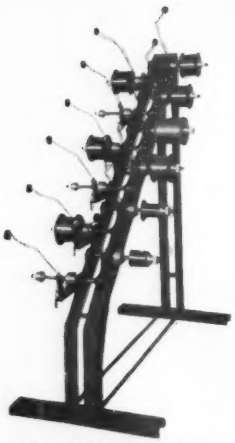
★ ★ ★

*Invented by Edwin E. Foster, Austin, Tex.

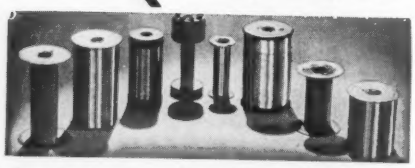
STANDARD UNI-DRIVE WIRE WINDER

INCREASE YOUR PRODUCTION WITH THIS WINDER

Wire Winder



Pay-off Attachment



Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

The new Uni-Drive Winder with Payoff Attachment is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel—no over or under-winding. Automatic Stop-Motion controls each strand. Compensating attachment produces perfectly controlled tension. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors up to ¾" diameter.
Payoff can be equipped with Carboloy Guide Inserts at additional cost.

STANDARD MILL SUPPLY COMPANY
PAWTUCKET, RHODE ISLAND, U.S.A.
1064-1080 Main St.
PAwtucket 3-1534 — 3-1535 — 3-1536

The Flex'ator is best suited for high-force, low-deflection compression applications. Compression forces are applied through pins to the eyes on the arms of the Flex'ator so that the helically-wound body of the device buckles out as the spring pins approach each other on a straight line. Unlike a compression spring, the Flex'ator itself is not located between the points of load application, so that it is possible to have another part in this area without affecting operation.

★ ★ ★

While the spring material in a Flex'ator and an extension spring, for example, are stressed in the same manner when loaded, the moment arm of the applied force on an extension spring is constant (equal to one-half the coil diameter), while the moment arm of this device increases as the spring body arches out further. Since the reacting force of the Flex'ator equals applied torque (proportional to fiber stress) divided by moment arm and both fiber stress and moment arm increase, dimensions of the Flex'ator such as wire diameter and length of spring body can be selected so that its resultant force remains nearly constant.

★ ★ ★

In addition to hundreds of load and fatigue tests on sample runs, they have already been successfully applied in such mechanisms as motor brush springs and counter-balance mechanisms. Hunter's engineering department is now working with a number of companies in developing new applications and in revising previous designs based on conventional spring loading.

Technical Bulletin on Plastisol Coatings

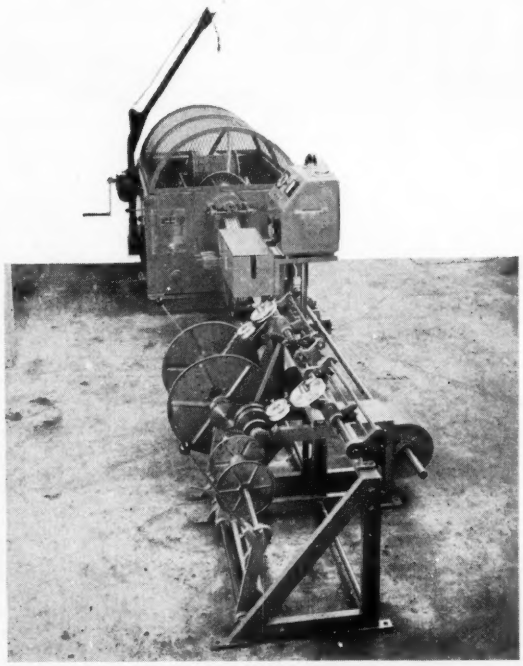
Data on application technique for low-cost plastisol coatings on wire goods, paper, fabric, foil and electrical assemblies are made available in a new 36-page booklet on Bakelite vinyl dispersion resin QYNV. Published by **Bakelite Company,** a Division of Union Carbide and Carbon Corporation, the new booklet also describes compounding and production of plastisols based on this resin as well as its general properties. These plastisols provide a durable film coating baked on most materials without the need for expensive equipment or costly solvents. Protective coatings for floor covering, work gloves, electroplating racks and tool handles are based on this resin because of its unusual resistance to oils, greases, alcohols, acids and alkalies.

★ ★ ★

Copies of this booklet, "Bakelite Vinyl Dispersion Resin QYNV, Technical Release No. 14", can be obtained from Bakelite Company 30 East 42nd Street, New York 17, N. Y.

New Wiping, Cleaning Material Announced

Major advances in the low cost, non-woven fabric field were announced today, by the **Leshner Corporation,** Hamilton, Ohio, one of the largest manufacturers of industrial textiles and cotton products.



See Our

HORIZONTAL TWINNER

- **HIGHLY PRODUCTIVE**
  - —800 lays a minute
  - —Large drums:

  Pay-off: 16 & 24" flange diameter
  Take-up: up to 42"
  - —double take-up assembly.
- **SURE**
  - —tension easy to balance
  - —equipped with a sparker device
  - —stopping for a predeterminate length.
- **EASY TO USE**
  - —Lays from 2" to 6"
- **ESPECIALLY EFFICIENT FOR MILITARY TRANSMISSION CABLE.**

POURTIER MACHINES

153, rue Gallieni

ROMAINVILLE **Seine (FRANCE)**

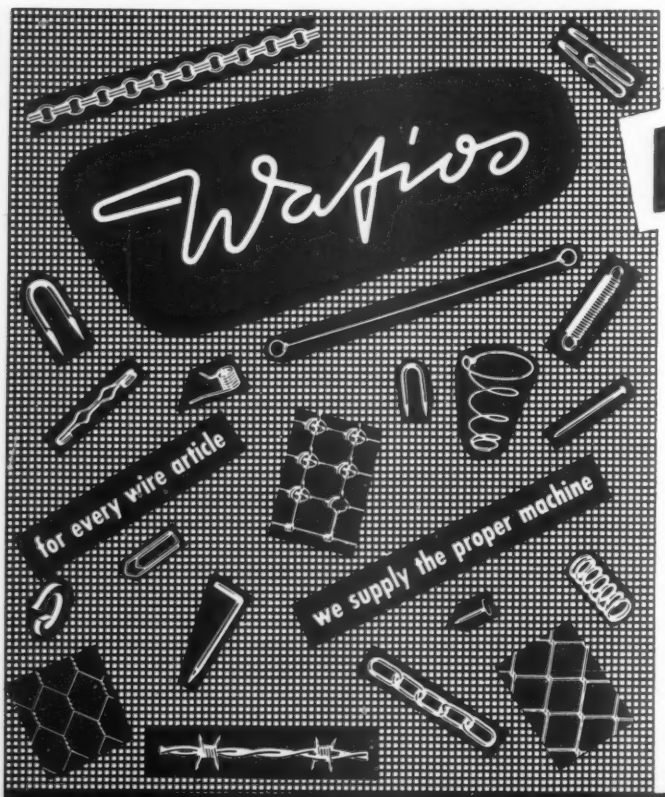
CAMDEN WIRE CO., INC.

Wire Fabricators

BARE OR TINNED COPPER WIRE AND STRAND

GALVANIZED STEEL WIRE AND WIRE ROPE

40 Masonic Avenue • Camden, New York



AUTOMATICS

FOR THE WIRE TRADE

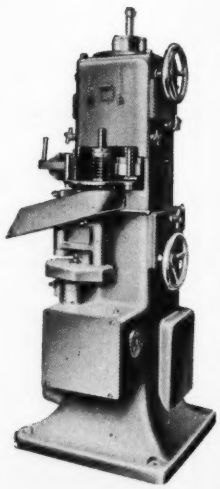
HIGH SPEED

WIRE NAIL PRESS

9 different sizes.

Wire diam. range: SWG 22-3

Length of nails: ¼-12″



Sole Agents: Kurt Orban Co., Inc.

34 Exchange Place, Jersey City 2, N. J.

WAFIOS MASCHINENFABRIK REUTLINGEN 3 / GERMANY

The company has been working for ten years on the development of lightweight, disposable, non-woven products that are economical for industrial use.

★ ★ ★

Non-woven fabrics are defined as any mat of fabrics held together with a bonding material. The fabric has a cloth-like appearance, better absorbency, higher wet strength, superior draping characteristics, smooth surfaces, and less tendency to lint.

★ ★ ★

First of the new, perfected inovations to be placed on the market, is a non-woven cheesecloth wiper, called "Wip-Eez."

★ ★ ★

B. J. Petricoff, President, said both retail and industrial firms have requested a compact, dust and polish cloth that is durable, inexpensive and disposable. Perfected after five years of research, the Leshner product is lintless, triple-absorbent, all-cotton and priced far below the conventional unsanitary and non-disposable cloth rags now in use.

★ ★ ★

Industrial uses range from cleaning of printing presses, polishing large and small glass products and the removal of grease and oil from machinery.

★ ★ ★

The product will also be packaged in one-hundred foot rolls in convenient dispenser containers with cutting edge, enabling "Wip-Eez" to be cut to any lengths. Each of these packages will contain 10,200 square inches. Special volume industrial prices will be available.

★ ★ ★

It was also stated that tests show that for many purposes the fabric is so strong that it may be used, rinsed and re-used, and so inexpensive, it may be disposed of after it is soiled.

★ ★ ★

For further information, please write the company.

New Extruded Aluminum Bar, Rod and Tubing Catalog

A new circular describing the aluminum extrusion process has been released by **Precision Extrusions,** Bensenville, Ill. This new, two-color circular is full of information and ideas that are helpful to the men who select extrusions.

★ ★ ★

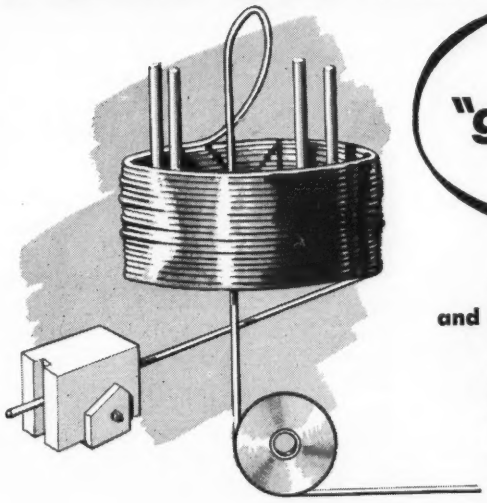
Eight major divisions make up this new circular. The extrusion process is explained briefly in conjunction with a line drawing illustrating how extrusions are formed. Advantages of the extrusion process and the six basic extrusion types are described and illustrated by isometric drawings.

★ ★ ★

Of value to designers and engineers is the two-page specification table listing the physical properties and recommended applications for the 14 most generally used alloys. Also included is a full-page tolerance table listing tolerances of the various types of extrusions.

★ ★ ★

DURPON* DRAWING COMPOUNDS



don't "get tired" easily

Initial performance is high, and they keep it twice as long!

Many soap lubricants for wire-drawing non-ferrous metals work well enough "the first time around." How well they perform when recirculated is another matter—which has a strong influence on the life of your expensive dies.

It's no accident that Nopco Durpon Drawing Compounds have double the effective life of ordinary drawing compounds. They are designed to have just that. A special additive prevents contamination of the effective drawing ingredients by dirt and by metallic particles . . . maintains the normal balance between soap and lubricant during re-circulation.

You gain two important economies from this lengthened stability. Nopco Durpon Drawing Compounds last longer . . . so do your dies.

All three types, Durpon, Durpon L and Durpon FW are natural lubricants; all are on the alkaline side (pH 8.0 to 10.5). Write today for technical bulletins and testing samples.

"stay stable longer"
DURPON
for intermediate wire
DURPON L
for rods, tubes, and heavy wire
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for fine wire

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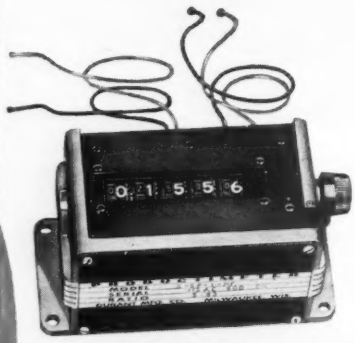
Wire Measuring Machine with Predetermined Counter Speed 2000 F.P.M.



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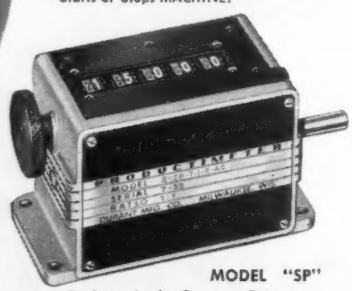
Predetermined Counter Counts Electrically — Lights LIGHT, Rings BELL, Starts or Stops MACHINE.



MODEL "SP"
Predetermined Counter Rotary or Stroke Models Lights LIGHT, Rings BELL, Starts or Stops MACHINE, mechanically.

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PRODUCTIMETERS 75th ANNIVERSARY
Count Everything

The several methods of pricing extrusions are fully described along with the method of packing. In conclusion, the circular illustrates the up-to-date facilities at Precision and ideal plant location.

★ ★ ★

Requests for copies of the new circular should be addressed to Precision Extrusions, Bensenville, Ill.

New Salt Bath Development Increases Efficiency

Ajax Electric Company, manufacturers of the well known Ajax-Hultgren electric salt bath furnace for heat treating and processing, has announced the development of a new salt bath isothermal quenching furnace—the Ajax Cataract Quench Furnace—having unusually high quenching power. Now, for the first time, because of this new furnace design, the quenching power of molten salt (400°F and above) equals that or surpasses that of agitated oil (100°F to 150°F).

★ ★ ★

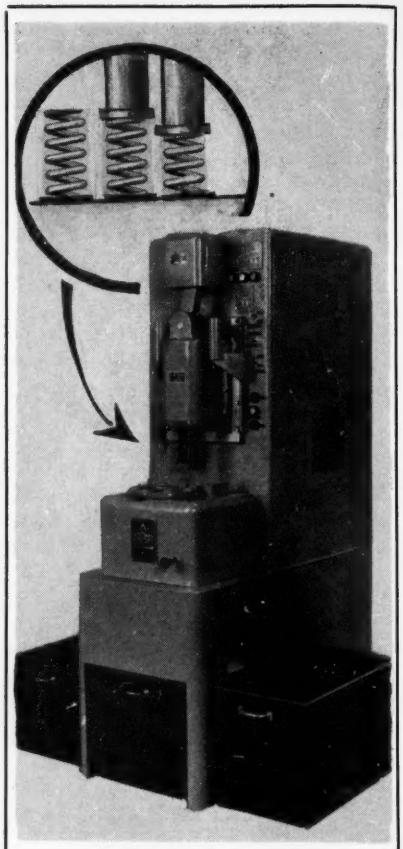
With this new quench furnace it is now possible to heat treat by the isothermal quenching process, steel products that were heretofore considered "borderline" cases — those that could not be austempered or martempered. Cataract quenching increases the cooling rate in the critical range 1300°F-1000°F thus getting past the nose of the "S" curve. Thus, any steel that can be satisfactorily hardened by oil quenching can now be either martempered or austempered in a Cataract Quench Furnace.

★ ★ ★

The secret to the phenomenal quenching power of the Cataract Quench Furnace is the uniform, high velocity downward flow of salt confined within a special quench header.

★ ★ ★

A complete description of Ajax Cataract Quench Furnaces, together with specifications and allied data, is included in Ajax Bulletin No. 700. Write directly to Ajax Electric Company, 928 Frankford Ave., Philadelphia 23, Penna. for copies of the Bulletin.



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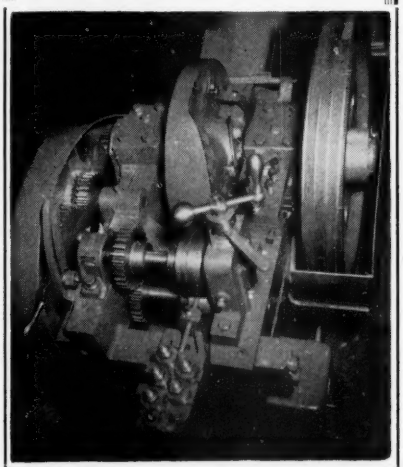

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Techalloy Completes New Building

A new building has been completed for $250,000 expansion for the **Techalloy Company, Inc.,** Rahns, Pa. This new company, which was formed in January, has already outgrown its original buildings. Techalloy management attributes this growth to its specialization of serving those customers in the electronic, industrial electrical equipment, instrument, industrial wire cloth, appliances and mechanical industries who have tighter specifications than have been commercially available up to the time Techalloy organized to serve those needs.

Laclede Opens New Fabricating Plant, Warehouse at Memphis

The formal opening on October 12, 1954, of the new Memphis plant of **Laclede Steel Co.,** St. Louis, was announced by **William M. Akin,** president.

★ ★ ★

The new plant, on which construction was started in February of this year, will contain warehouse and fabricating facilities for a full range of reinforcing steel, wire, welded wire mesh, steel joists and other Laclede products for highway and building contractors and the many industrial customers of the Company in the mid-south.

★ ★ ★

The location of the plant will permit truck and rail service on steel shipments to a territory including Kentucky, Tennessee, Arkansas and the northern section of the Gulf States, east of the Mississippi River.

★ ★ ★

Facilities for barge handling of steel directly from the Laclede mills in Alton and Madison, Ill., were included in the planning for this unit of the Company. The main buildings include two 80-foot wide crane spans with 30-foot clearance over stock racks and equipment.

★ ★ ★

This Memphis plant, together with the already established plants

7 out of 9

WIRE MILLS

that Liquor Finish Wire

use **STANNOUS SULFATE** *because*

Tin Losses Are Reduced . . .
by elimination of high tin sludging due to incomplete reaction in feather tin method.

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Double your Refinished Tungsten Carbide Die Production

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"IT CORRECTS THE DIE"

Polishing Machine

It's factory assembled—just plug it in to nearest electric outlet.

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manufacturers of
Wire Die Finishing Machinery
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QAB-WUX—Montclair, N. J.
The Standard of the Wire Industry

at New Orleans, Beaumont and Dallas, is another link in the chain of Laclede Steel service facilities for the south and southwest.

★ ★ ★

The Memphis plant and sales office will be managed by **John Faber,** for many years Laclede southern district sales representative in Memphis. The building and plant construction was designed and supervised by Gardner and Howe, Memphis engineers.

New Oakite Research Laboratory Opened

Research and product development in chemical cleaning took another giant step on September 15, when **Oakite Products, Inc.,** threw open the doors to their new and expanded laboratories at 350 Hudson Street, New York City. An extensive look into the future of industrial cleaning materials and methods was the feature of the afternoon.

★ ★ ★

John A. Carter, president of the concern, and J. J. Basch, manager of research and product development, were on hand to welcome the visitors. Mr. Carter, in a brief opening talk, stated that, "Our 45 year history has been a constant research and service program, and these new facilities will enable us to make even greater strides in furnishing modern industry with the products it demands."

★ ★ ★

Guests and officials of the company took part in the opening ceremony and then toured the laboratories, which cover 30,000 square feet on a single floor.

★ ★ ★

The laboratory, which is subdivided into three major sections —product development, customer service, and engineering—will continue to devote itself to the cleaning and sanitation problems of the nation's production and service industries. In addition, a complete pilot plant is planned for the small scale manufacture of detergents and solvents prior to extensive field testing.

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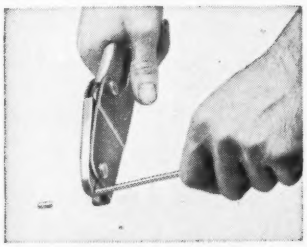

Here's UTICA's newest muscle-saver, time-saver! Only nine inches long, UTICA® POW'R PLI'RS™ handle jobs that usually require a 24" bolt cutter or hacksaw!

These cam action, high leverage cutters slice through heavy steel wire with an ease that will amaze you! They stay sharp, too – for these cutters are forged, hand-honed and *extra*-hardened by electronic induction. Handles are heat treated pressed steel.

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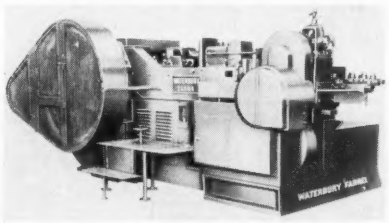
The chemical research laboratory, manned by a staff of chemists and chemical engineers, working in 11 special laboratories, spearheads all new product developments. Here experienced personnel devote their time and talents to such specific things as bacteriological, inorganic, transportation and oil refinery, analytical, conversion coating, and organic research projects.

New, Faster Solid Die Header Announced

An important stride in the field of cold heading equipment has been made by **Waterbury Farrel Foundry and Machine Co.**, Waterbury 20, Conn., with the development of a new ½" "Waterbury" Solid Die Double Stroke Header.

★ ★ ★

This machine has new design features which step up production



Solid Die Header

speed and blank length capacity without sacrificing quality. It will produce headed blanks up to 6" long from an 8" maximum wire cut off, at 80 per minute. Shorter blanks (up to 3½") can be headed at 100 blanks per minute. Previously, open die headers were required to form blanks of comparable size with the resulting disadvantages of slower speeds, extrusion was not possible and a fin was produced where the dies came together.

The new header is built in both long and short stroke, with the crankshaft throw the only difference in construction.

Long Stroke Machine—This machine is by far the most versatile of the two. Both long and short work can be produced at the rate of 80 blanks per minute. Blank maximum capacity is equal to a blank ½" in diameter and 6" length under the head. Maximum length of wire cut-off on the long stroke machine is 8".

Short Stroke Machine—Greater production can be achieved on this machine in cases where only short work is re-

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NEW PARENTS

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It wasn't so long ago that NELCO grew up and we proudly announced to the world that our lacquer had been christened with that name. We mentioned the many sides to NELCO's character such as the NELCO for vinyl insulated hookup wire, the NELCO for electrical tubing, the NELCO for aircraft low tension wire, and many others.

We have been most pleased by the market's reception of NELCO. As NELCO continues to grow and diversify, we're sure our customers will be increasingly interested in its many possibilities.

To facilitate NELCO's growth and ease the parental discipline, the former parents, New England Lacquer Company, have combined their efforts with the Chemical Products Corporation. In fact. it's still the same child—with new parents.

The NELCO name will be retained and so will the famous NELCO trademark shown above. And your problems with cable coatings and saturants will be tackled by an increased staff working with greater facilities. We welcome the toughest problems you have.

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The DANFORTH PROCESS of reclaiming produces powders that are *guaranteed* to be 99% or better pure. Some reclaiming work runs as low as 80%—but never DANFORTH'S.

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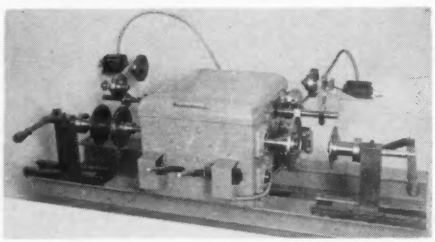

THE BOYD Model 6025 SPOOLER

PRECISION ENGINEERED

The Boyd 6025 spooler is a precision engineered unit available with one or two spindles.

The traverse mechanism is a single screw, solenoid actuated for positive "no-dwell" reversing which runs in a constant shower of oil.

Traverse lengths are readily adjustable from one-half to eight inches, or longer if desired in a matter of seconds with the machine in operation and can be made for larger spools where customer requirements demand lengthier traverse. Infinite rates of traverse for varying sizes of materials are achieved through easily applied change gears over a great range.

The main housing is of all steel welded construction with cast aluminum cover of drip-proof design. All wear points are protected with anti-friction ball bearings to further enhance the rugged, long-lived features of this machine.

Auto-stop motion at predetermined footages is included as standard equipment on each individually operated spindle along with manual clutch release for emergency stop.

Special power equipment for constant speed or smooth slow starts is available and easily adapted to your needs. Quick release tail stocks can be had as either hand or foot operated while spool adapters can be supplied to cover your entire range of finished package spools.

Send for Full Particulars

BOYD & SONS MANUFACTURING CO.

1434 CALLOWHILL ST. **PHILADELPHIA 30, PA.**

quired. Operating at a production rate of 100 blanks per minute, the maximum blank capacity is equal to a blank of ½" in diameter and 3½" length under the head. Maximum length of wire cut-off on the short stroke machine is 5½ .

★ ★ ★

Wire is fed from the coil by a positive roll feed to the cutoff. This cutoff consists of a pair of thick blades held in slides to assure a clean, square cutoff. Wire blanks are then transported from the cutoff slides to the heading die by an independent transfer mechanism. After being headed, blanks are ejected from the heading die by a knockout mechanism. Accessible adjustments are provided to compensate for wear and to retime these mechanisms in relation to one another when it is desired to do so.

★ ★ ★

Punch knockout, timed ejector and knockout relief mechanisms can also be supplied with these machines to increase their versatility in heading special shapes previously considered impossible. Filtered, automatic lubrication is employed throughout, with force fed to stations requiring full flow, and metered systems to those requiring less oil.

★ ★ ★

Further information will be sent upon request.

Bulletin Describes Spray Booths

The Despatch Oven Co., 619 8th St., S.E., Minneapolis, Minn., has issued a bulletin, No. 66, describing and illustrating a line of "Cleanaire" paint spray booths.

★ ★ ★

Blueprints and cutaway pictures show how these water wash booths, said to embody entirely new and revolutionary engineered principles, function in production paint spraying operations. Specifications for the entire range of sizes are included. Two pages are devoted to another line of dry spray booths equipped with paint arrestor filters for piece or production work.

★ ★ ★

Requests for Bulletin No. 66 will be filled promptly by the company.

Keystone Issues Report to Employees

Keystone Steel and Wire Company has issued an exceptionally fine booklet, in which it reports to employees on its activities and the status of the company's operations.

★ ★ ★

Opening with a letter to employees by **R. E. Sommer,** President and General Manager, describing their progress and hopes, the booklet goes into a description of the wage, personnel, production, tax, sales and profit status for the year ending June 30, 1954.

★ ★ ★

Pictorially and in Text, employees are shown how and where the gross income was spent, with a detailed analysis of what they received in wages, shared profits, insurance and other profits. Employee activities inside and outside of the plant are described, and a section is devoted to various measures the company has taken to increase job security.

★ ★ ★

This booklet is an outstanding example of what can be done to increase management-labor respect and to create a genuine esprit-de-corps and pride in being a member of the Keystone family.

New Capacitor For Highly Critical Uses

Styracon (R) "B" Capacitors for use in such critical applications as analog and digital computers, precision timing circuits, high Q tuned circuits and bridge circuits in electronic equipment, were announced recently by the **Sprague Electric Company** to answer such requirements as extremely high leakage resistance, freedom from dielectric absorption, extremely low power factor (or high Q), close capacitance tolerance, and high capacitance stability.

★ ★ ★

Available in various mechanical configurations to meet individual needs, all Styracon "B" capacitors are hermetically sealed. Operating temperature range is -55 to +85°C. Additional details are fully given in Engineering Bulletin 250 avail-

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Written by Kenneth B. Lewis, as only he could write. This remarkable book treats of the various operations in wire making, giving the history and theories underlying each process, tracing the development of machinery, equipment and supplies used in the industry, and naming those individuals and companies involved in the evolution of our industry to its present stage of development. A highly readable treatise. You'll like it!

The book, sponsored by the Wire Association, is an unusual contribution to the literature on the art of making wire. It is not a handbook nor reference work, but is one that will bear much reading, re-reading and study. Any wire man will be better equipped for his work through a knowledge of the contents of Mr. Lewis' book.

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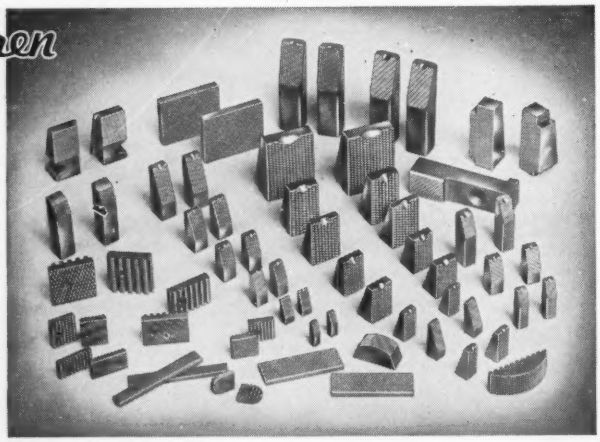

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High-Strength Low-Alloy Steels

Bulletin A-61, 16 pages, describes a group of these steels, their characteristics, their corrosion resistance, how they are formed and worked, and the design factors involved in their use. Applications in many fields are given. Economics of application are explained. For a copy, write to **International Nickel Co.,** New York 5, N. Y.

New Process for Extracting Nickel and Cobalt

With the agreement for pilot plant study of a new process for obtaining nickel and cobalt from Cuban ore, **General Services Administration** has moved to strengthen the free world's defenses and to add to Cuba's growing mining and metallurgical industry.

★ ★ ★

The agreement, negotiated with **Freeport Sulphur Company,** was announced by **Edmund F. Mansure,** Administrator of General Services. It provides for the construction and operation by the company of a pilot plant to study on a large scale the new process for production of nickel and cobalt from deposits at Moa Bay on the northeast coast of Cuba. The plant, to be financed by the Government, will be located near New Orleans on land recently purchased by Freeport. It will treat 50 tons of ore per day supplied by Freeport without charge to the Government, and the work will be done by Freeport at no fee.

★ ★ ★

The pilot operation will be aimed at bringing the nickel resources of the Moa Bay district into commercial production. The test runs are designed to provide a basis for a commercial plant which would turn out nickel and cobalt to meet the direct requirements of the United States as well as steelmakers and other industrial users.

★ ★ ★

Freeport has been financing with its own money the study of certain phases of the process, which includes techniques devised by Chemical Construction Company. The Government proposed the 50-ton pilot program in order to obtain engineering and cost data on a scale to permit maximum assurance of economy and efficiency in the development of a new source of these two strategic metals. The Government will advance up to 6¼ million dollars for the construction and operation of the pilot plant.

★ ★ ★

In addition to the pilot agreement, the Government entered into a contract to buy nickel and cobalt from the commercial plant which **Nicaro Nickel Company,** a Freeport subsidiary, is planning to build upon successful completion of the pilot plant program. This purchase contract is contingent upon the Government's decision to enter into the commitment at the end of the pilot program. The agreement provides for the possible purchase by the Government of 150 million pounds of nickel and 15 million pounds of cobalt at prevailing market prices by June 30, 1963.

★ ★ ★

Exploration and development of the Moa Bay orebody was completed last year by Nicaro. The deposit contains over 40 million tons of ore, averaging approximately 1.35 per cent nickel and approximately 0.14 per cent cobalt. This makes it one of the most important proven sources of nickel available to the free world outside of Canada.

Phosphate Coatings in the Cold Drawing of Steel Wire

(*Continued from page* 1443)

Instead of producing a zinc phosphate coating the materials involved create a coating of iron oxalate which performs the same function on the chrome and chrome nickel steels. The original development, Bonderite SS*, was introduced in the seamless tube mills in 1947 and this type of treatment has since spread in use to in-

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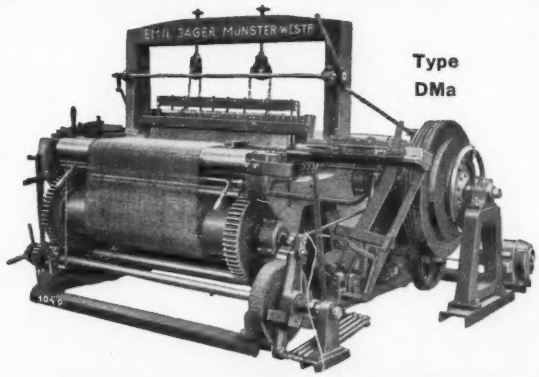

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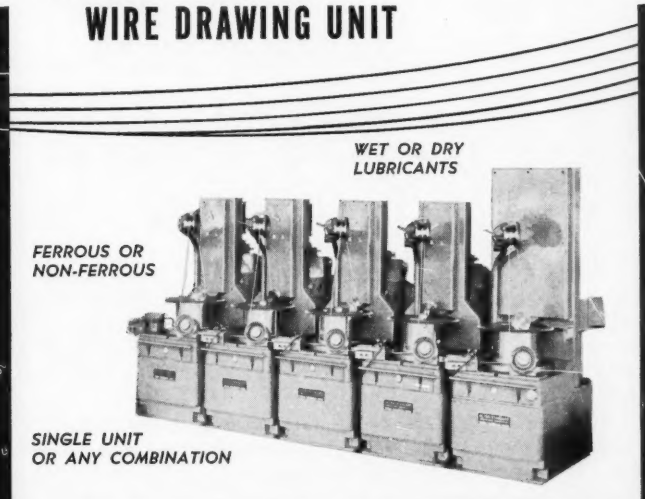

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Spark Testers, Pin hole counters.

Sensitive Hipot Testers.

Bench spoolers.

Demonstrations Arranged

- Continuous production type.
- For non-destructive testing—will not burn or mark wire.
- Combination unit—applies 2 tests simultaneously:
  For "Spark Testing" without marking wire.
  For Pin Hole Detection and Counting.
- Dual test electrodes, detectors, and magnetic counters.
- Adjustable output voltages—0 to 20,000 Volts, AC or DC.

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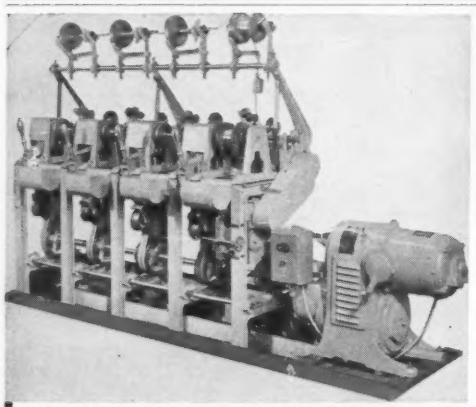

1900-HV MULTIPLE SPINDLE SPOOLER

SPECIFICATIONS
Size Range: .010" to .080" or heavier if soft and many flat wire sizes.
Max. Spool Size: 16" flange diameter.
Capacity: usually 4 to 8 spindles.

The 1900-HV Spooler is a rigid, precision machine which will consistently produce a uniform, dense wire lay. Both the traverse and spindle drives are regulated through wide-range, stepless, variable speed units, eliminating change gears. The 1900-HV is completely adaptable to your particular constant or changing demands. All controls are positive. Adjustments are made accurately with the spooler in operation and without tools.

Both smooth acceleration and rapid stopping is obtained through a single lever at each station. Spool changing is simple and rapid. Anti-friction bearings are used on all shafting and spindles.

Your special requirements can be incorporated into the design. Each machine is delivered ready for operation from your power supply. Payoff stands furnished as extras.

Consult us on your spooling problems.

ROBERT J. EMORY COMPANY

31 East Runyon Street Newark 5, N. J.

clude nearly every basic manufacturer of seamless alloy tubing. The original Bonderite SS process still retains advantages in use on heavy reductions but a later development, Bonderite 70*, was found to be much less critical as to preparatory cleaning and pickling and has been used most widely in redraw stainless tube mills and wire mills.

★ ★ ★

In producing these coatings for wire drawing, the annealed pickeled wire is immersed in the coating bath for 2 to 5 minutes at 140°F to 160°F. The non-metallic iron oxalate coating produced is then rinsed, neutralized, and air dried. Wire thus treated is drawn through calcium stearate soaps in the conventional manner.

★ ★ ★

The coatings for stainless are more easily applied than is lime or the metallic coatings such as copper and lead and also do not present the problems in removal after drawing attendant to the other preparations. On breakdown passes of wire and rod these coatings have permitted higher speeds and greater reductions. On certain alloys, however, particularly the 300 grades, we have not been too successful to date on 5 to 7 pass multiples.

★ ★ ★

Bonderite 70 provides the wire industry with an easily applied, low cost application process resulting in an improved surface finish on the drawn product and applicable in most cases where heavy reductions are employed. The coating produced works equally well on the wire range of alloys and projected work will, we hope, solve the problems of high speed drawing of the finer sizes.

★ ★ ★

To revert momentarily to carbon wire, there is now developing a growing demand for phosphate treated cold heading wire from the mills. Many cold heading applications are found to be greatly improved with wire thus treated. On certain jobs, where severe extrusion or head filling problems exist, the phosphate coatings have greatly improved the operation and re-

sults obtainable. In some cases manufacturers have installed their own facilities for recoating wire received from the mill and others send their wire to job shops for phosphate coating because the treatment performs so much better in certain applications. The residual coating after heading has also been found to give greatly improved life to thread rolling dies.

★ ★ ★

In conclusion it can be said that the day of phosphate coatings for high speed continuous production of wire for drawing and cold heading is near at hand. he representatives of the American wire industry characteristically demand higher speeds and greater efficiency. We appreciate their efforts and contributions to this particular development and are proud to be a part of it.

*Bonderite - Registered trade mark United States Patent Office.

*Bonderite SS Process and Bonderite 70 Process - Patented processes of Parker Rust Proof Company, Detroit, Mich.

A New Copper Wire Rod Mill With Continuous Finishing

(*Continued from page* 1447)

★ ★ ★

From the 12″ mill on, the rolling is done "continuously" — at increasing speeds as the rod decreases in cross-section. Between each group of finishing mills a double looping table permits formation of slight horizontal loops which eliminates undue tension in the copper rod.

★ ★ ★

The finished wire rod comes out of the last 10″ stand in two strands at a speed of 2400 fpm (max.). The rod is coiled by three Garrett type coilers. The conveyor, which is partially immersed in a water-tank—for cooling and scale prevention—brings the coils to an automatic tying machine. From the tying machine another conveyor takes the coils to a pickling unit—the last step in the finishing process which is entirely automatic.

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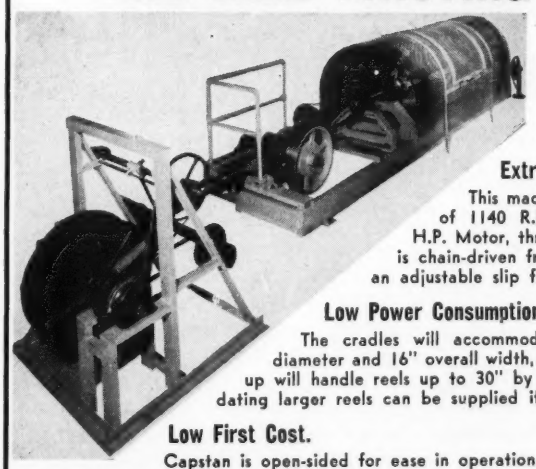

with LET-OFF, MOTOR DRIVE and TAKE-UP

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This machine is built to run at a speed of 1140 R.P.M. The drive is from a 3 H.P. Motor, through a Vee belt. The take-up is chain-driven from the capstan shaft through an adjustable slip friction.

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The cradles will accommodate reels up to 30" in diameter and 16" overall width, while the let-off and take-up will handle reels up to 30" by 16". Take-ups accommodating larger reels can be supplied if needed.

Low First Cost.
Capstan is open-sided for ease in operation.

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Change gears are standard Boston Change Gears. The Machine will twist a wide variety of wires with lays varying from ½" to 6".

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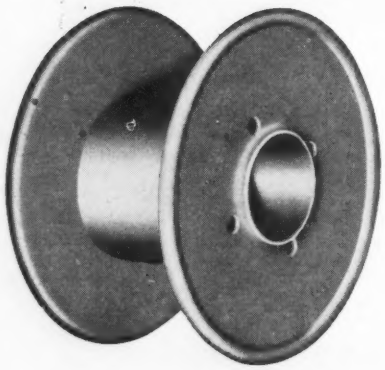

Industry's tireless search for greater efficiency is constantly posing new problems in high speed for the wire industry. This has underscored, as never before, the need for correct design and careful construction of reels for wire drawing machines.

For over a half century, Apco Mossberg has produced reels of highest quality. Apco Mossberg High Speed Reels are manufactured to extremely close tolerances — with particular emphasis on trueness and balance.

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APCO MOSSBERG COMPANY
ATTLEBORO, MASS.

Continuous Wire Drawing and Packaging

(*Continued from page* 1433)

that in most cases the users come back for more and are very frank in telling us of their satisfaction. However, it is only proper to mention some of the disadvantages which have come up since we have distributed Payoff Barrels on a production basis.

★ ★ ★

The first concerns room, floor space, and it is quite true that there are plants where space is at such a premium and where machines are jammed so closely together that it is impossible to get a Payoff Barrel into the department. Even this rather difficult situation has not stopped some enthusiastic users, since it appears to be quite practical, in view of the long running time of a Payoff Barrel, to guide or pipe the wire from a considerable distance to the machines.

★ ★ ★

The second disadvantage is a matter of storage space. A greater tonnage of spooled or coiled wire may be stored in a smaller area than wire in Payoff Barrels although when stacked 3 high on pallets, 6000 lbs. plus may be racked in a space 44″ square and the stack will be approximately 102″ high.

★ ★ ★

The third question is that of inventory problems. We were told by one purchasing department that if they provided one Payoff Barrel for each of their 60 odd machines they would be carrying more wire in inventory than was allowable. This was solved when they remembered that wire being used from Payoff Barrels was wire in process, and not in inventory. Everyone was happy until it was discovered that 30,000 lbs. would overload their floor, but we loaded the barrels with only about 300 lbs. each and at the last writing everyone was satisfied.

★ ★ ★

There are certain operations where the taking off of wire from

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a dead coil presents difficulties because of the turn as each strand is brought up and over into the machine. This is usually the first point raised by anyone seeing wire paid off in this way for the first time. It is surprising that in such a large majority of cases the turn does no harm at all.

★ ★ ★

Part of this is due to the fact that in many operations the first step is straightening either by two plane roll or rotary straightener and this seems to cancel out any effect of the turn.

★ ★ ★

Also the turn, as each strand comes off a dead coil, a spool standing on one end, or from a Payoff Barrel, seems to be much less serious than many wire users believe who have been taking wire from revolving reels or spools.

★ ★ ★

No one realizes better than ourselves that we are only beginning to learn something about the ramifications of the Payoff Package method. It causes far more drastic changes in the processing, shipping and dispensing of ferrous and non-ferrous wire than we ever imagined it would during the first stages of its development. These changes have taken place in our plant, and we believe that they will take place in other plants if only because the system is less costly in all three of these phases than are other methods. I refer of course, to those types of wire to which the package and the method are suitable.

★ ★ ★

As an example of the differences in practice that the Payoff system can bring about, the question of annealing finished wire has often come up and it has been felt that it might be necessary to redesign furnaces, provide heat resistant drums etc. It now seems practical (particularly with low carbon wire) to strand anneal either by resistance or induction as a part of the wire drawing operation and after the wire has left the last die and capstan. From this point on the wire is no longer being pulled but

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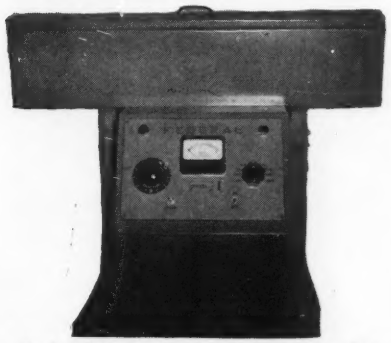

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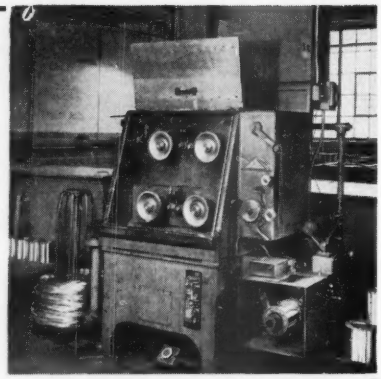

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may be pushed through a suitably heated guide tube which may contain a non oxidizing atmosphere and a cooling zone before being poured unstressed into the revolving Payoff Barrel.

★ ★ ★

This method should be applicable to non-ferrous wires as well, as we have found that soft wires pay out of the package very successfully. Copper and iron magnet wires are now being loaded, shipped and dispensed and the whole operation appears to be satisfactory.

★ ★ ★

Another development which we feel will come about as a direct result of the completely different properties applying to wire in the Payoff package is the possibility of offering pre-straightened wire to the ultimate consumer in a much wider range of materials (low carbon steels, brass, etc.) than has been considered practical and economical up to now. We have done a considerable amount of work on what we feel is advanced high speed straightening equipment which is designed to operate at wire drawing speeds. Because the wire is Payoff packaged without stress after the final operation, it may be removed from the drum still straight by revolving the drum on a turntable.

★ ★ ★

This is probably not to be recommended for all applications but we know of several where it would be extremely valuable. This particular development is in its early stages and we mention it only to illustrate what we feel is one of the most interesting results of the Payoffpak method as a whole. It furnishes a different approach to many varied operations.

★ ★ ★

We have been asked many times what range of wire sizes we would consider practical and can only say that our experience has been confined to sizes between .018 and .125; however, we have heard of much heavier and lighter sizes.

★ ★ ★

I have made some mention of the mechanical equipment we have used to load Payoffpaks and I must say we have been greatly aided by the co-operation extended us by the Coulter & McKenzie Machine Company who, being confronted with a completely new problem, and without benefit of working drawings, produced a practical Payoffpak loading machine in just thirty days which has been operating two shifts ever since. Of course, a number of improvements have been made over the original model but the original principle has been adhered to as being simple, economical and easily maintained. I am speaking now of the upright block or capstan, with a pressure roll and a chain driven turntable to revolve the drum.

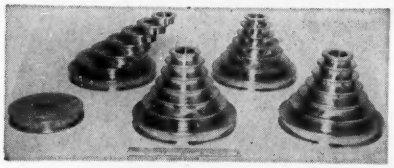
★ ★ ★

This is not to say that this is the only practical method. We have accomplished the desired results by other methods. We made a machine, for instance, with an inverted revolving capstan from which the wire dropped into the drum as drawn, and another machine which loads a non-revolving Payoffpak. There are probably almost as many possible methods of loading Payoffpaks as there are devices to aid in paying off the wire. Some are simple, some are complicated, but surprisingly enough all are mechanically feasible. It would seem then that the method or system as a whole is not critical —it certainly has shown us many economies. In our plant we have twenty-five or more barrel loading units, which has enabled us to ship enough Payoffpaks to get a reasonably broad picture of our users' reactions. It is a very pleasant experience to hear people, whose problems have been made somewhat easier by this development, express their enthusiasm so frankly. Also, their suggestions and ideas have been extremely valuable.

★ ★ ★

Finally, we feel that, while the various phases of making and using wire have been highly developed over many years, and have reached a high peak of efficiency, perhaps the Payoffpak system is

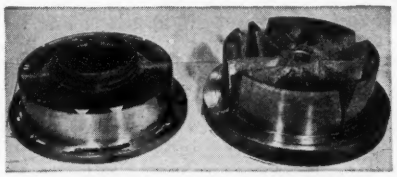
PK HARDSURFACING PAYS!



SYNCRO A-16 DRAW RINGS

Pictured at left and below are some wire drawing machine blocks. Many other parts can be hardsurfaced to advantage.

VAUGHN 20" BLOCKS



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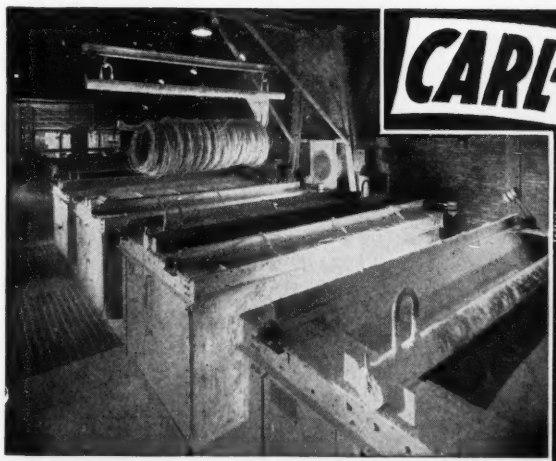

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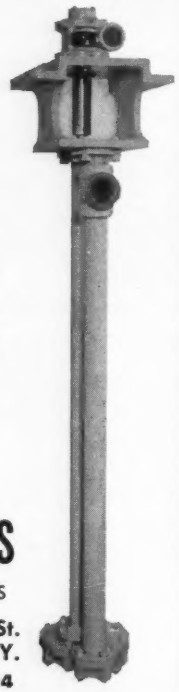

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just enough different that it may provide us with some new angles of approach to some old problems and perhaps open the way to more opportunities than we realize now.

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It is designed to assist engineers, designers, production personnel and purchasing executives in the selection and specific use of the most suitable aluminum rod, bar and wire for different applications.

* * *

Contents deal with the production of aluminum and its specific properties and characteristics as related to rod, bar and wire, as well as new data regarding various alloys, their applications, fabrication and finishing methods.

* * *

A glossary of descriptive words and definitions and many helpful engineering tables are included in the book to simplify and speed reference work.

* * *

The book is 5½ by 8½ inches, case-bound and contains much original art work and photographs illustrating applications and manufacturing processes.

* * *

Throughout the publication all aluminum alloys are indicated by the four digit index system in accordance with the new alloy designation system for wrought aluminum as adopted by The Aluminum Association. Old commercial designations are shown only where they will assist in making immediate comparisons.

* * *

This book may be obtained free of charge when requested on company letterhead, or at a cost of two dollars (2) for personal libraries. Copies are available from Technical Editor, Kaiser Aluminum & Chemical Sales, Inc., 22 North LaSalle Street, Chicago 1, Illinois.

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Official publication of The Wire Association

Die Making by the Electrical Discharge Machining Process

(*Continued from page* (1434)

chanical Machining" correspond to those under the heading "Electrical Discharge Machining."

Mechanical Machining

1. A number of steel laps are machined which will progressively be used to give the desired form before polishing.
2. Abrasive material is used for metal removal by reciprocating the lap and mechanically removing metal.
3. Diamond wheels and diamond boring bars are employed for forming round holes .250 and over.
4. High speeds are necessary gor grinding. Machine rigidity and wheel concentricity are very messary to prevent vibration.
5. Small round die-nibs can be set-up in multiple-head lapping machines for fast economical production.
6. Formed dies are made by lapping, mechanically and by painstaking hand work.
7. All dies have to have radii blended and a hand polish for finish.

Electrical Discharge Machining

1. A number of brass electrodes are made to the exact shape of the finished die, complete as to detail of bell, approach and bearing. These are also progressively used as brass is eroded. It may take several electrodes to reach finish size.
2. No abrasives or chemicals used. Metal is removed by electrical discharge action, in a non-reciprocating machine.
3. Shaped electrodes are used for making round holes. Electrodes do not revolve.
4. Where a formed electrode is used, there is no vibration. There is a single straight-line motion of the tool into the work. It is possible to slowly revolve the die nib for greater accuracy.
5. As machining each die is a single operation, electrical discharge machining cannot at present compete on small round dies.
6. Formed dies are made by formed electrodes eliminating all machine and hand lapping.
7. All dies have radii blended in the same cutting operation and are readily polished because there are no scratches to remove and the non-directional surface presents no polishing problems.

Conclusion

Electrical Discharge Machining has advanced to the point where definite metal removal rates have been established, surfaces are consistent and operation of the equipment, automatic and repetitive.

* * *

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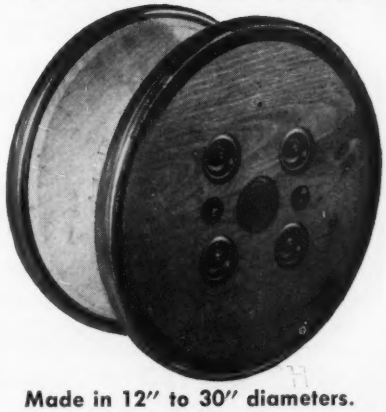

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Electrotinning of Copper Wire from Stannous Fluoborate Bath

(*Continued from page* 1428)

The fluoboric acid is added to 30 gallons of water and then the stannous fluoborate is added. The gelatin is added to 2.7 gallons of warm water in a suitable vessel such as a pail and allowed to swell overnight. The powdered beta naphthol is added and the mixture stirred continuously while bringing the mixture to a boil. Should the beta naphthol be in flake form, it should be dissolved in the minimum amount of methanol before adding to the gelatin-water solution. A creamy mixture will result which should be added with continuous stirring to the bath. The catechol may be added directly to the bath.

Comments on Bath Make-Up and Operation

Agitation: Air agitation should not be used inasmuch as air will oxidize the tin to the stannic state which does not deposit tin and also results in sludging. The movement of the wire and circulation of the bath permit the use of high current densities.

★ ★ ★

Addition Agents: The above addition agents (gelatin and beta naphthol) are controlled by observing the condition of the deposit. If

loose tin is noted, then additional quantities of these materials should be added. In practice, a schedule of additions may be worked out so that they can be made at regular intervals. When running continuously, daily additions in the ratio given in the bath formula will be found advantageous. For example, it may be found necessary to add 0.5 lbs. gelatine and 1.25 oz. of beta naphthol. A guide on frequency of additions to make may be done by use of a test panel plated as in Hull cell.

★ ★ ★

Anti-Oxidant: The addition of catechol will minimize the oxidation of stannous to stannic tin. The frequency of addition can best be controlled by determining the stannic tin content by chemical analysis.

★ ★ ★

Fluoboric Acid Concentration: The concentration of this acid should be maintained at 200 grams or more (200-300) per liter. A high acid concentration assists in anode corrosion and promotes stability of the bath.

★ ★ ★

Tin Concentration: Lowering the tin concentration will result in lowering the limiting current density. Raising the tin concentration will raise the limiting current density.

★ ★ ★

Current Efficiency: The stannous fluoborate bath, operated under optimum conditions, has cathode and anode efficiencies of approximately 100%.

★ ★ ★

Organic Contamination: Organic contamination of the bath, often indicated by discoloration of the solution, can be removed by treatment of the solution with activated carbon. Since the carbon will also remove addition agents, more of these materials, including the gelatin, beta naphthol and catechol, should be added after treatment. The filter aid and activated carbon should be of low silica content.

★ ★ ★

Control of Bath: The tin and free fluoborate acid contents should be controlled by chemical analysis.

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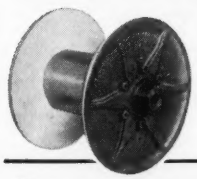

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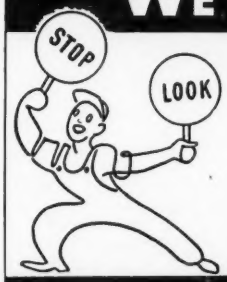

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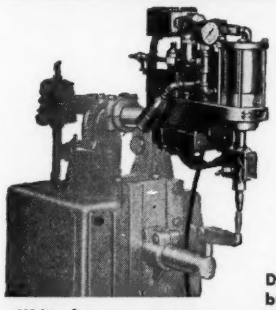

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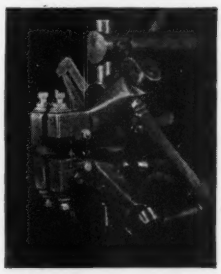

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Advantages of Fluoborate Bath

The stannous fluoborate bath has a number of distinct advantages, namely:

1. **Temperature—The bath operates at room temperature or slightly above.**
2. **Ventilation—The bath has no fumes and requires no ventilation.**
3. **Royalties—No royalties are required.**
4. **Operation—Operation is rather simple as compared to the alkaline bath where the anode current density is critical.**
5. **Addition Agents—Addition agents for the bath are commercially available.**
6. **Plating Rate—Since the tin metal is available from a lower valence state in acid baths than in alkaline baths, the rate of metal deposition is doubled at equal amperage. Acid tin baths also operate at high cathode efficiencies.**
7. **Throwing Power—While the throwing power of acid tin solutions is not equal to that of alkaline baths, it is nevertheless considered very good.**

Cross Section of Wire

This picture shows a layer of 0.00015 inch of tin on a No. 14 copper wire. This is the third layer from the top. The other two layers

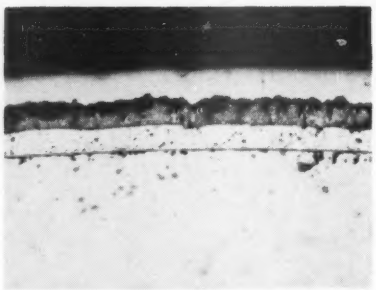

Fig. 2—Microphotograph of tin layer on copper wire. "A" is the tin layer.

are nickel and copper to reinforce the tin layer to prevent it from dislodging during the polishing operation. Note the uniformity of the thickness of the deposit.

Conclusion

Because of their stability, high speed characteristics and simplicity of operation, other fluoborate plating chemicals are finding use in the wire industry. For example, copper fluoborate is employed in the plating of steel wire for the telephone industry and lead fluoborate for coating of stainless steel wire prior to drawing.

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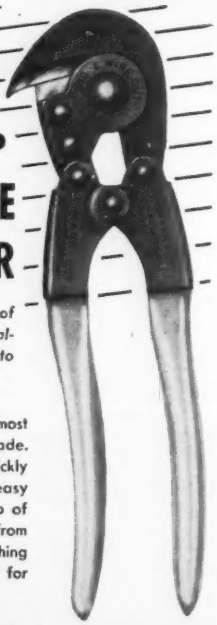

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It is the most up-to-date treatise on steel-wire manufacture available and covers the latest developments in wire processing, such as mechanical descaling, increased drawing speeds and lubricants for these high speeds, die shapes and modern testing procedures. The entire range of wire manufacture, from rods to finished products are discussed.

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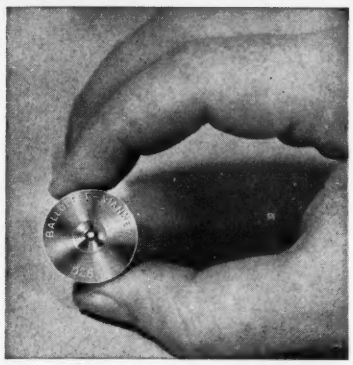

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They are: **Donald K. Miner,** formerly a jet-engine materials engineer with the General Electric Company's Evendale, O., Aircraft Gas Turbine Division, and **J. David Benedict** who transferred from Carboloy Department's permanent magnet operations.

★ ★ ★

Mr. Miner, who worked on jet engines of advance design, has been with the General Electric Company 5 years. He holds a bachelor's degree in mechanical engineering from Michigan State College.

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Mr. Benedict holds a B.S. degree in management engineering from Renssellaer Polytechnic Institute. He joined Carboloy Department two years ago.

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E. W. Bliss Company, manufacturer of mechanical and hydraulic metal working presses, announced in September that its five-year association with **C.I.T. Corporation,** industrial financing firm, has been extended due to continued customer acceptance of the Bliss deferred payment plan.

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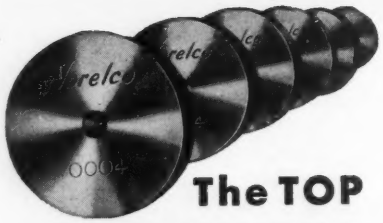

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Note below the highly polished precision shaped drawing channel of this die for drawing copper which gives a burnished finish to the wire and long life to the die.

Prestressing Wires—Stress-Relaxation and Stress-Corrosion Up To Date

(*Continued from page* 1424)

the preliminary stage. In the meantime, we include a useful empirical treatment known as the Goodman diagram, as shown in Figure 7. The high stress range band given is probably a reasonably safe approximation. Various researchers in the field of fatigue have confirmed the existence of such a relationship some of the work even showing a somewhat wider band than that defined by the straight line limits. The high stress endurance limits suggested do not give cause for alarm, and the few experimentally determined points we have tend to verify this concept.

Summary

1. The high strength steel wires used in prestressing need protection from corrosion. Under stress, irregular corrosion creating notch effects, hydrogen embrittlement, or stress-corrosion cracking can cause sudden wire failures. Even before placing, the wires need reasonably careful handling and storage. Professor Magnel of Belgium reports numbers of failures in heat treated wires shortly after stressing in three bridges in Germany. Apparently these wires, highly stressed by coiling, lay in contact with the soil and were attacked by ground waters. This was probably a case of nitrate cracking.

★ ★ ★

2. The free-loop tests described in this paper demonstrated convincingly the high susceptibility of heat-treated wires to various types of stress corrosion. Where such wires are to be used, therefore, particular care must be taken to ensure maximum protection.

★ ★ ★

3. Static load relaxation for these high strength wires has been fairly well defined by recent wire industry work. At 70 per cent of ultimate strength the 1000-hour loss is about seven per cent for both cold drawn and stress-relieved wires. The latter show some advantage at lower stresses, this and

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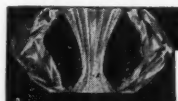
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4. Preliminary work on resistance to dynamic loads in the high stress range suggests adequate safety. Additional work now under way will provide greater assurance with respect to present and contemplated prestressing practices.

Welding for Engineers

Welding is examined as a field in itself in "Welding for Engineers" by **Harry Udin, Edward R. Funk,** and **John Wulff.** Published in September by **John Wiley & Sons,** the book deals with the theory and practice necessary for further exploration into this science.

★ ★ ★

Drawing on the fields of physics, chemistry, mathematics, metallurgy, and mechanical engineering, the authors unify the diverse elements that contribute to the art of welding. They present each unit process immediately after its principles have been developed; the principle of metallic adhesion, for example, is bracketed with the process of cold welding. As new elements are introduced, more complicated processes are used for illustration.

★ ★ ★

"Welding for Engineers" begins with a complete study of cold, hot pressure, and resistance welding, followed by permanent-electrode arc-welding, consummable-electrode processes, and welding with chemical heat sources. Extensive coverage is given to brazing and braze welding, and a concluding section goes into the principles of weld inspection and testing.

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tungsten alloy—twice as heavy as lead—produced by powder metallurgy, is announced by **Carboloy Department of General Electric Company**, Detroit 32, Mich.

★ ★ ★

The data sheet, HV-4, also includes a graph comparing the absorption rate of Hevimet and lead under a narrow beam of Cobalt 60, in addition to detailed mechanical, thermal, electrical and other property evaluations.

Bulletin Presents New Shell Thread Rolling Machine

A new, 4-page, 8-1/2" x 11" bulletin published by **The Waterbury Farrel Foundry and Machine Company**, Waterbury, Conn., shows and describes the company's automatic, inclined shell thread rolling machine.

★ ★ ★

The booklet illustrates the machine as it is normally used, connected to an eyelet machine, and explains how it automatically rolls the required thread on hollow metal parts produced by the eyelet machine. Another illustration shows the shell threader arranged for independent hopper feed. Samples of some of the work which can be produced on the machine are reproduced to show various types and sizes of threads.

★ ★ ★

The bulletin discusses the use, construction, operation, drive and tooling of the machine and gives a complete table of specifications, including capacities, for two different sizes.

★ ★ ★

Copies of this new circular #833-E1-2 are available without obligation by request on company letterhead to Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

New Wire Company for Canada

Canadian Electric Wire Ltd., of **Canada** is to have a new wire mill, which has been formed to produce wire for wire weaving, electrical and other industrial fields. It is expected that the mill will start production in early 1955.

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A new line of Camac Cast Steel centrifugal pumps are now available. Cast steel is superior to cast iron for handling alkaline solutions such as cyanide and caustic and acids such as chromic.

★ ★ ★

Heads of from 10′ to 150′ can be provided with flows from 10 G.P.M. to 200 G.P.M. Seal is either Camac Special Acid or Teflon and can be water-cooled or not. Design is heavy for rough chemical service.

★ ★ ★

Complete units and parts can be shipped from stock. Performance curves, prints and prices are available on request from the manufacturer: **Carl Buck & Associates,** Essex Fells, N. J.

Stanley Works Buys H. L. Judd Co.

Stanley Works of New Britain has purchased **H. L. Judd Co.** of Wallingford, producer of drapery hardware and other household wire items for the past 125 years. The H. L. Judd plant in Wallingford and another in the South will be operated as a separate division of Stanley Works, and will continue production of the same items, with the same personnel.

★ ★ ★

Stanley Works is continuing its studies of a proposed additional steel mill operation. Present indications point to Bridgeport as the probable location.

Titanium Symposium

Titanium's importance to the aircraft industry resulted in the **National Aircraft Standards Committee,** of the **Aircraft Industries Association,** sponsoring a Titanium Symposium, which was held in Cleveland in October.

★ ★ ★

A representative of the Navy Department said, "The recent development of titanium metal, with its unique combination of several favorable physical properties, has made it potentially one of the most important engineering materials, particularly in the field of aviation. The tremendous possibilities of titanium fasteners for aircraft use were visualized a number of years ago by the Bureau of Aeronautics which sponsored projects to develop techniques for manufacturing bolts, nuts, rivets, screws and similar other fastening devices, from titanium and titanium alloys."

★ ★ ★

The report of the Titanium Symposium is being printed in book form. Included in the book are papers on Government Plans and Programs by representatives of the Dept. of Defense, Navy, Air Force, and Army; and papers on Production, Fabrication, and Aircraft Applications by representatives of industry. Also included are illustrations and charts. Discussions, in question and answer form, are completely reported.

★ ★ ★

A copy of this 350 page book may be bought from: **National Standards Association** 527 Washington Loan & Trust Bldg. Washington 4, D. C.

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Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corp., Buffalo, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Drever Company, Phila., Pa.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.
Lignum-Vitae Products Corp., Jersey City, N. J.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
Electronic Rubber Co., Stamford, Conn.
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens, Ford Glass Co., Fiber Glass Div., Toledo, Ohio
Merrimac Paper Co., New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Plymouth Cordage Company, Plymouth, Mass.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.
Plymouth Cordage Company, Plymouth, Mass.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Cosa Corporation, New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Crimping Wire
Cedar West Tool Co., New York, N. Y.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Wean Equipment Corp., Cleveland, Ohio
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
International Wire Products Co., Midland Pk., N. J.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Electrode Grinding
Cosa Corporation, New York, N. Y.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Co., Midland Pk., N. J.
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Blashill and Company, Arthur, Worcester, Mass.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Karl Hack, Reutlingen (Wurtt), Germany
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Fourdrinier Looms
Cedar West Tool Co., New York, N. Y.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
International Wire Products Co., Midland Pk., N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Karl Hack, Reutlingen (Wurtt), Germany
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Oven Co., Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Cedar West Tool Co., New York, N. Y.
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used). New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, O.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Cedar West Tool Co., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
International Wire Products Co., Midland Pk., N. J.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watkins Machine Shop, R. S., Sandy Hook, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Fidelity Machine Co., Phila., Pa.
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Karl Hack, Reutlingen (Wurtt), Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Spring Testing
Emmericher Maschinenfabrik, Emmerich, Germany

MACHINERY—Staple
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt, Germany.

MACHINERY—Straightening & Cutting
Cosa Corporation, New York, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Medart Co., The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Studmaking
Cosa Corporation, New York, N. Y.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Blashill and Company, Arthur, Worcester, Mass.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Corp., Midland Park, N. J.
Michigan Oven Co., Detroit, Mich.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watkins Machine Shop, R. S., Sandy Hook, Conn.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Emmericher Maschinenfabrik, Emmerich, Germany
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Michigan Oven Co., Detroit, Mich.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Edmands Company, The, Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

MACHINERY—Washer Form'ng
Cosa Corporation, New York, N. Y.

MACHINERY—Winding Wire
Cedar West Tool Co., New York, N. Y.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Michigan Oven Co., Detroit, Mich.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Herborn, Germany
International Wire Products Corp., Midland Park, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watkins Machine Shop, R. S., Sandy Hook, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass

MACHINERY—Welded Wire Fabric
Maschinen & Stahl, A. G., Entwicklungs Verwertungs Gesellschaft, Switzerland

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Wean Equipment Co., Cleveland, Ohio

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICS—for Wire Insulation
Electronic Rubber Co., Stamford, Conn.

PLIERS—For Wire
Utica Drop Forge & Tool Corp., Utica, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wean Equipment Corp., Cleveland, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Roll-A-Reel, Cincinnati, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

REEL CRUTCHES—
Roll-A-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Blocks
Madesco Tackle Block Co., Easton, Pa.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SODIUM—for Descaling
du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

STRIPPERS—Wire, Electric
Utica Drop Forge & Tool Corp., Utica, N. Y.

TANKS—Compound
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Welding Wire, Strip & Foil (Pressure)
Utica Drop Forge & Tool Corp., Utica, N. Y.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.
Utica Drop Forge & Tool Corp., Utica, N. Y.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

WELDERS—Spot and Butt
Hoffman Co., Robt. W., Chicago, Ill.
Maschinen & Stahl, A. G., Entwicklungs Verwertungs Gesellschaft, Switzerland
Micro Products Co., Chicago, Ill.
Utica Drop Forge & Tool Corp., Utica, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Worcester, Mass.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Spencer Wire Corp., Union, N. J.

WIRE—Needle
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Crucible Steel Co. of America, Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Carpenter Steel Company, Webb Wire Div., New Brunswick, N. J.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens-Ford Glass Co., Fiber Glass Div., Toledo, Ohio.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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Morgan Construction Company
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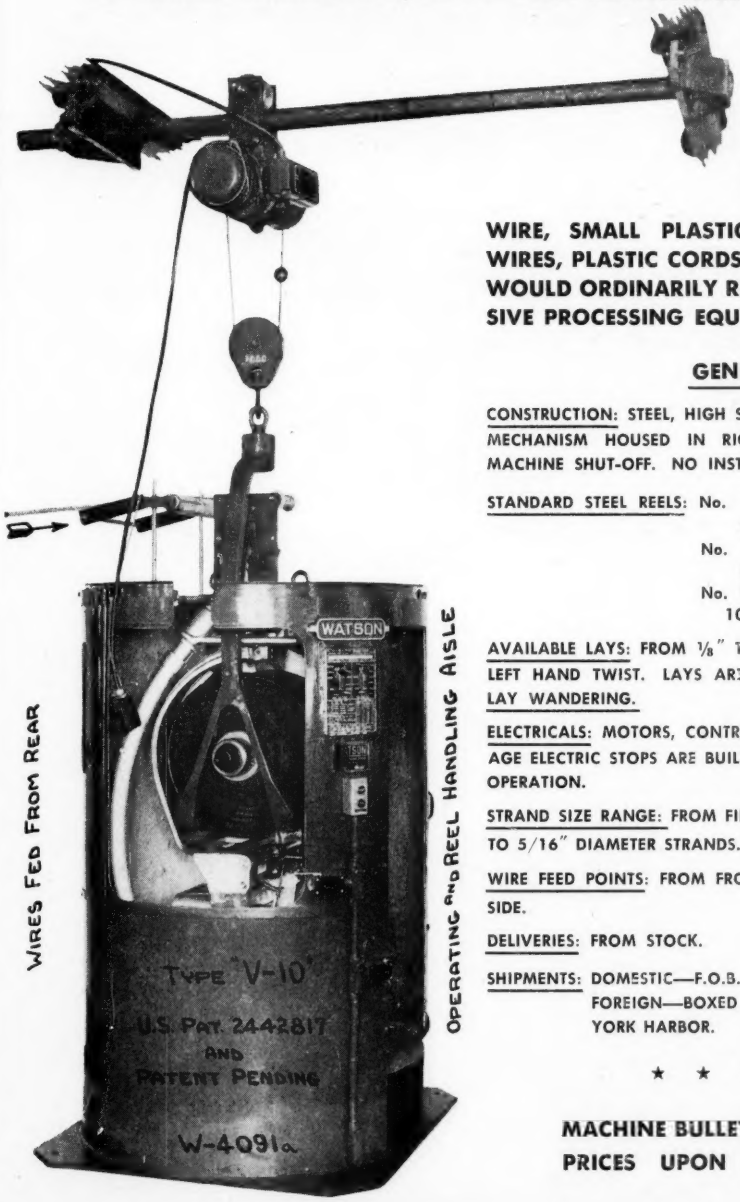

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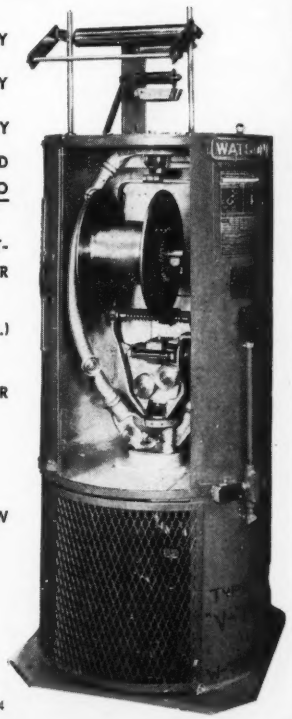

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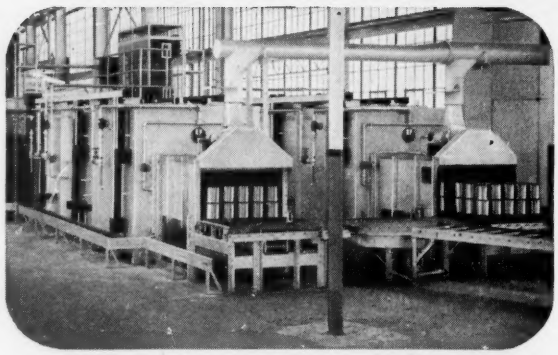

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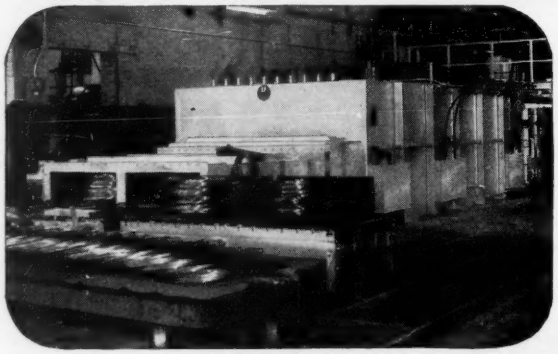

An EF continuous bright annealing furnace in which the wire is conveyed through the various zones on two parallel rows of bulkhead type trays.

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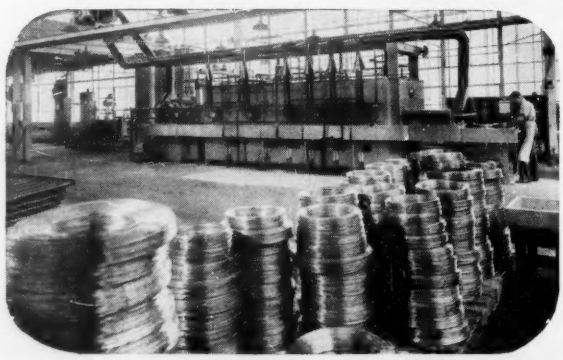

Clean annealing alloy wire in an EF gas-fired radiant tube continuous roller hearth furnace. Handles coils up to 30" in diameter.